

**Fishery Data Series No. 11-66**

---

---

# **Upper Cook Inlet Salmon Escapement Studies, 2010**

by

**David L. Westerman**

and

**T. Mark Willette**

December 2011

---

---

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



## Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the *Système International d'Unités* (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics</b>	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	$H_A$
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	$e$
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, $\chi^2$ , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient (multiple)	R
milliliter	mL	west	W	correlation coefficient (simple)	r
millimeter	mm	copyright	©	covariance	cov
		corporate suffixes:		degree (angular)	$^\circ$
<b>Weights and measures (English)</b>		Company	Co.	degrees of freedom	df
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	expected value	$E$
foot	ft	Incorporated	Inc.	greater than	>
gallon	gal	Limited	Ltd.	greater than or equal to	$\geq$
inch	in	District of Columbia	D.C.	harvest per unit effort	HPUE
mile	mi	et alii (and others)	et al.	less than	<
nautical mile	nmi	et cetera (and so forth)	etc.	less than or equal to	$\leq$
ounce	oz	exempli gratia (for example)	e.g.	logarithm (natural)	ln
pound	lb	Federal Information Code	FIC	logarithm (base 10)	log
quart	qt	id est (that is)	i.e.	logarithm (specify base)	log <sub>2</sub> , etc.
yard	yd	latitude or longitude	lat. or long.	minute (angular)	'
		monetary symbols (U.S.)	\$, ¢	not significant	NS
<b>Time and temperature</b>		months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	$H_0$
day	d	registered trademark	®	percent	%
degrees Celsius	°C	trademark	™	probability	P
degrees Fahrenheit	°F	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
degrees kelvin	K	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
hour	h	U.S.C.	United States Code	second (angular)	"
minute	min	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
second	s			standard error	SE
<b>Physics and chemistry</b>				variance	
all atomic symbols				population sample	Var var
alternating current	AC				
ampere	A				
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

***FISHERY DATA SERIES NO. 11-66***

**UPPER COOK INLET SALMON ESCAPEMENT STUDIES, 2010**

David L. Westerman

Alaska Department of Fish and Game, Division of Commercial Fisheries, Soldotna  
and

T. Mark Willette

Alaska Department of Fish and Game, Division of Commercial Fisheries, Soldotna

Alaska Department of Fish and Game  
Division of Sport Fish, Research and Technical Services  
333 Raspberry Road, Anchorage, Alaska, 99518-1565

December 2011

ADF&G Fishery Data Series was established in 1987 for the publication of Division of Sport Fish technically oriented results for a single project or group of closely related projects, and in 2004 became a joint divisional series with the Division of Commercial Fisheries. Fishery Data Series reports are intended for fishery and other technical professionals and are available through the Alaska State Library and on the Internet: <http://www.adfg.alaska.gov/sf/publications/> This publication has undergone editorial and peer review.

*David L. Westerman, ([david.westerman@alaska.gov](mailto:david.westerman@alaska.gov))*

*and*

*T. Mark Willette, ([mark.willette@alaska.gov](mailto:mark.willette@alaska.gov))*

*Alaska Department of Fish and Game, Division of Commercial Fisheries,  
43961 Kalifornsky Beach Road, Suite B, Soldotna, AK, 99669-8276, USA*

*This document should be cited as:*

*Westerman, D. L., T. M. Willette. 2011. Upper Cook Inlet salmon escapement studies, 2010. Alaska Department of Fish and Game, Fishery Data Series No. 11-66, Anchorage.*

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

**If you believe you have been discriminated against in any program, activity, or facility please write:**

ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

**The department's ADA Coordinator can be reached via phone at the following numbers:**

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648, (Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

**For information on alternative formats and questions on this publication, please contact:**

ADF&G, Division of Sport Fish, Research and Technical Services, 333 Raspberry Road, Anchorage AK 99518 (907)267-2375.

# TABLE OF CONTENTS

	<b>Page</b>
LIST OF TABLES.....	ii
LIST OF FIGURES.....	iii
LIST OF APPENDICES.....	iii
ABSTRACT.....	1
INTRODUCTION.....	1
Sonar Development in UCI.....	1
Sonar Sites.....	2
Fish wheels and Apportionment.....	3
Escapement goals.....	3
Objectives.....	4
METHODS.....	4
DIDSON Operations.....	4
Observer Errors.....	6
Bendix Operations.....	7
Fish Wheels.....	9
Apportioning salmon migration and age composition.....	9
Cessation Criteria.....	11
Age, Sex and Length Data.....	11
Stream surveys and weir counts.....	11
Climatological.....	12
RESULTS.....	12
Kenai River.....	12
Kasilof River.....	13
Yentna River.....	14
Crescent River.....	15
DISCUSSION.....	16
Kenai River.....	16
Kasilof River.....	18
Yentna River.....	18
Crescent River.....	20
ACKNOWLEDGMENTS.....	21
REFERENCES CITED.....	21
TABLES AND FIGURES.....	23
FIGURES.....	75
APPENDIX A: KENAI RIVER DATA.....	87
APPENDICES B: KASILOF RIVER DATA.....	101
APPENDICES C: YENTNA RIVER DATA.....	117
APPENDICES D: CRESCENT RIVER DATA.....	127

## LIST OF TABLES

Table	Page
1 DIDSON to Bendix conversion factors by bank for the Kenai and Kasilof rivers .....	24
2 Fish wheel selectivity coefficients for sockeye, pink, chum, and coho salmon estimated on the Susitna River .....	24
3 Sockeye salmon passage estimates in the Kenai, Kasilof, Crescent, Yentna, and Susitna rivers 1978–2010.....	25
4 Salmon run estimates into the Kenai River, 1 July–19 August, 2010. ....	26
5 Cumulative proportion by date of sockeye salmon passage recorded in the Kenai River, 1994–2010.....	27
6 Distribution of sockeye salmon passage by bank (% of total count) in the Kenai, Kasilof, Crescent, and Yentna rivers, 1979–2010. ....	29
7 Inshore and offshore distribution of fish along both banks of the Kenai and Yentna rivers (top) based on the DIDSON subsample counts, and distribution by sector (Bendix counts) for both banks of the Crescent River (bottom), 2010. ....	30
8 Daily fish wheel catch by species for the Kenai River, 1 July–19 August, 2010.....	32
9 Summary of fish wheel catch and CPUE for the north bank fish wheel at RM 19, Kenai River, 1978–2010.....	33
10 Age composition of Kenai River sockeye salmon sampled from its fish wheel, 1970–2010.....	35
11 Average length composition of the major age classes of sockeye salmon sampled from the Kenai River fish wheel, 1980–2010. ....	36
12 Observer comparisons by individuals (#1–10) and by groups. Individuals 1–5 were comprised of the Kenai crew and individuals 6–10 represent other crews. ....	38
13 Average DIDSON subsample counts by observer stratified by fish abundance.....	39
14 Late run sockeye salmon escapement weir and survey counts in 8 index streams, Kenai River drainage, 1969–2010.....	40
15 Climatological data for the Kasilof, Kenai, Crescent, and Yentna rivers, 1979–2010.....	42
16 Estimated sockeye salmon migration into the Kasilof River, 2010.....	44
17 Cumulative proportion by date of salmon passage recorded in the Kasilof River, 1994–2010.....	45
18 Daily fish wheel catch by species for the Kasilof River, 2010.....	47
19 Summary of fish wheel catches and CPUE for the north bank of the Kasilof River, 1983–2010.....	49
20 Age composition of sockeye salmon sampled from the Kasilof River fish wheel catch, 1969–2010.....	50
21 Average lengths of the major age classes sampled from the Kasilof River fish wheel, 1980–2010. ....	51
22 Estimated minimum and maximum (DIDSON) migration ranges of salmon passage into the Yentna River drainage, 7 July–15 August, 2010. ....	53
23 Cumulative proportion by date of sockeye salmon passage recorded into the Yentna River, 1994–2010.....	55
24 Daily fish wheel catch for the north bank of the Yentna River, 2010. ....	57
25 Daily fish wheel catch by (all) species for the north bank (top) and south bank (bottom), Yentna River, 7 July through 15 August, 2010. ....	59
26 Summary of fish wheel catch and CPUE for the north bank of the Yentna River, 1982–2010.....	61
27 Summary of the fish wheel catch and CPUE for the south bank of the Yentna River, 1982–2010. ....	62
28 Age composition of sockeye salmon sampled from fish wheels on the Yentna River, 1983–2010.....	63
29 Length composition of the major age classes of sockeye salmon sampled from the Yentna River fish wheels, 1983–2010.....	64
30 Index or weir counts of various northern district spawning areas for 2010.....	66
31 Estimated salmon migration by species into the Crescent River, 24 June–5 August, 2010, using Bendix side-looking sonar. ....	67
32 Cumulative percentage of fish timing into the Crescent River, 1992–2010.....	68
33 Crescent River fish wheel catch, 2010. ....	70
34 Historic fish wheel catch for the Crescent River, 1993–2010.....	71
35 Age composition of sockeye salmon sampled from the Crescent River, 1979–2010.....	72
36 Summary by year of average lengths and male to female ratios of sockeye salmon sampled from the Crescent River between 1987 and 2010. ....	73

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
1 A map of Upper Cook Inlet, Alaska, showing sites where salmon sonar enumeration projects are conducted. ....	76
2 Sonar site river profiles of the Kenai (top), Kasilof (middle) and Yentna rivers (bottom).....	77
3 Total daily sonar counts by bank for sockeye salmon passage into the Kenai and Kasilof rivers, 2010.....	78
4 Mean hourly salmon migration rates by bank in the Kenai (top), and Kasilof (bottom, 2010) rivers. ....	79
5 Daily water level fluctuations (solid line) for the Kenai (top), and Kasilof (bottom) rivers, 2010. ....	80
6 The daily ranges in migratory timing of sockeye salmon in the Yentna River, 2010.....	81
7 Mean hourly salmon passage rates by bank in the Yentna (top), and Crescent (bottom, 2010) rivers. ....	82
9 Daily water level fluctuations for the Yentna (top) and Crescent rivers (bottom), 2010.....	83
9 Daily run timing of sockeye salmon by bank (top) and total (bottom) in the Crescent River, 2010. ....	84
10 The relationship between run timing (peak hourly counts) and time of high tide on the sockeye salmon run into the Crescent River, 2010.....	85

## LIST OF APPENDICES

<b>Appendix</b>	<b>Page</b>
A1 Salmon migration estimates along the north bank, Kenai River, 2010. ....	88
A2 Estimated salmon passage along the south bank, Kenai River, 2010.....	89
A3 DIDSON estimates and Bendix equivalents including the sport fish allocation (17.6%) for the north bank, Kenai River, 2010.....	90
A4 DIDSON estimates and Bendix equivalents including the sport fish allocation (17.6%) for the south bank, Kenai River, 2010.....	91
A5 Kenai River north bank DIDSON estimates (all species) by hour, 2010. ....	92
A6 Kenai River south bank DIDSON estimates (all species) by hour, 2010. ....	96
B1 Estimated salmon migration along the north bank of the Kasilof River, 2010.....	102
B2 Estimated salmon passage along the south bank, Kasilof River, 2010.....	104
B3 Kasilof River DIDSON subsample counts and Bendix equivalents for both banks, 2010. ....	106
B4 Kasilof River north bank DIDSON subsample estimates by hour. ....	108
B5 Kasilof River south bank subsample DIDSON estimates by hour, 2010. ....	112
C1 Estimated salmon passage ranges adjacent to the north bank of the Yentna River, 2010. ....	118
C2 Estimated salmon passage ranges adjacent to the south bank of the Yentna River, 2010. ....	120
C3 Yentna River north bank DIDSON estimates (total fish) by hour, 2010.....	122
C4 Yentna River south bank DIDSON estimates (total fish) by hour, 2010.....	124
D1 Escapement counts by species for the north bank of the Crescent River, 2010. ....	128
D2 Escapement counts by species for the south bank of the Crescent River, 2010. ....	129
D3 Crescent River north bank counts (total fish) by hour, 2010.....	130
D4 Crescent River south bank counts (total fish) by hour, 2010.....	132
D5 Crescent River north bank Bendix sonar counts (total fish) by sector, 2010. ....	134
D6 Crescent River south bank Bendix sonar counts (total fish) by sector, 2010. ....	135



## ABSTRACT

In 2010 the Alaska Department of Fish and Game used dual-frequency identification sonar (DIDSON) to estimate sockeye salmon (*Oncorhynchus nerka*) escapements into the Kenai, Kasilof, and Yentna rivers of Upper Cook Inlet, Alaska. This was the first year that DIDSON was used to estimate escapement on the Kasilof River, and the second year it was used on the Yentna River. The estimates generated from the DIDSON were converted to Bendix equivalents in the Kenai and Kasilof rivers because the 2010 escapement goals were based on Bendix counts. Yentna River escapement estimates were not used for inseason management because of possible fish wheel-selectivity biases. Instead, escapement ranges were estimated postseason for sockeye, pink (*O. gorbuscha*), chum (*O. keta*), and coho (*O. kisutch*) salmon using DIDSON counts and fish wheel selectivity indices obtained from the literature. Bendix Corporation side-looking sonar equipment was used to estimate sockeye salmon escapement into the Crescent River. The sockeye salmon escapement estimates were 970,662 into the Kenai River, 267,013 into the Kasilof River, 59,399–144,949 into the Yentna River, and 86,333 into the Crescent River. The predominant age classes for sockeye salmon in the Kenai River were: 1.3 (44.4%), 1.2 (23.4%), and 2.3 (23.9%); Kasilof River: 1.3 (31.2%), 1.2 (27.7%), and 2.2 (31.2%); Yentna River: 1.2 (39.4%), 1.3 (23.3%), 0.2 (12.5 %), and 2.3 (11.5%); and Crescent River: 1.3 (37.5%), 2.3 (36.4%), 2.2 (15.1%), and 1.2 (10.4%). Length and sex ratio data were collected for sockeye salmon in each river.

**Key words** Upper Cook Inlet, Kenai River, Kasilof River, Crescent River, Yentna River, Susitna River, sockeye salmon, *Oncorhynchus nerka*, age/sex/length, sonar, escapement, salmon migration, passage, fish wheel, substrate-less, Bendix, DIDSON, side-looking sonar.

## INTRODUCTION

We used sonar technology in conjunction with fish wheel capture rates to estimate sockeye salmon *Oncorhynchus nerka* escapements into the Kenai, Kasilof, Susitna (Yentna), and Crescent rivers that flow into Upper Cook Inlet (UCI), Alaska (Figure 1). In this report, ‘escapement’ refers to estimates of the number of salmon migrating upstream to spawn past a fixed point on the river. When significant numbers of fish are harvested upstream of the enumeration point, the number of fish that survive to spawn will be less than the ‘escapement’ referred to in this report.

### SONAR DEVELOPMENT IN UCI

The use of sonar to estimate the inriver salmon migration began on the Kenai and Kasilof rivers in 1968 with the use of multiple transducer systems (MTS), transducers arrayed linearly in up-looking positions (Namtvedt et al. 1977; Davis 1971). Transition from MTS to side-looking sonar aimed horizontally atop an artificial substrate was tested in the Kenai River between 12 July and 3 August, 1977 with a single side-looking system (1977 model) transducer deployed on the north bank. Migration counts in 1977 used an MTS array. Side-looking sonar proved to be more practical and was implemented on the Kenai River in 1978. A similar unit was deployed for the first time on the north bank of the Kasilof River in 1977 (south bank counts also used an MTS array), and by 1979 both banks of the Kasilof River were utilizing side-looking sonar. In the Susitna River, an attempt to utilize MTS equipment failed in 1976, leading to use of side-looking sonar, which began with limited success in 1978. Side-looking sonar has been used since 1979, and is continuing to be used to enumerate the Crescent River sockeye salmon escapement.

Initially, all side-looking transducer systems were mounted on 15 cm (6 in) by 18.3 m (60 ft) diameter aluminum tubing, (artificial substrate), and positioned on the bottom of the river, perpendicular to the bank. This arrangement forced fish to move across the artificial substrate and through the sonar beam. A transition to substrate-less counters began in the late 1980s because artificial substrates affected fish behavior, required constant maintenance and created safety problems with tree and brush entanglements with the tube. Substrate-less counters began

in the Kenai River in 1987 (north bank) and 1993 (south bank); Crescent River (both banks) in 1988; Yentna River in 1994 (south bank) and 1995 (north bank); and in the Kasilof River in 2003 (both banks).

Originally, sonar operations were at different sites on the Kasilof, Yentna, and Crescent rivers. In 1983, the Kasilof River site was relocated from the outlet area of Tustumena Lake (about 3 km below the lake) to river kilometer 12.1 (mile 7.5), near the Sterling highway bridge and closer to Cook Inlet (King and Tarbox 1984). The Susitna River site was abandoned in 1985 when recurrent flooding rendered the site untenable. The site was relocated to the Yentna River in 1986, about 9.2 km (6 miles) upstream of the confluence with the Susitna River and about 53 (river) km from Cook Inlet. Sonar operations began at Crescent River in 1979 below the outlet of Crescent Lake but was relocated nearer Cook Inlet (~2.5 km) in 1984 (King and Tarbox 1987). The Kenai River sonar site has been located at river kilometer 30.9 (mile 19.2) since the 1960s.

A dual-frequency identification sonar (DIDSON; Belcher et al. 2001, 2002) was used for the first time to estimate salmon migration in UCI on the south bank of the Kenai River in 2007 and on the north bank in 2008; for the first time on both banks of the Kasilof River in 2010, and for the first time in the Yentna River (both banks) in 2009. Bendix Corporation<sup>1</sup> side-looking sonar counters (1978 and 1980 models) as described by King and Tarbox (1989), Gaudet (1983), and Bendix Corporation (1980 and 1984) continue to enumerate Crescent River sockeye salmon. No plans have been made to switch to DIDSON technology in the Crescent River in the near future.

## **SONAR SITES**

The Kenai River is a glacial river about 120 m wide at the sonar site when water level peaks in early August. Bottom profiles (Figure 2) have not changed substantially since the mid-1960s. The Kenai River north bank transducer has always been located on an inside curve of the river that slopes gradually (~1 m drop in 30 m) toward the opposite bank. The south bank slope is steeper (dropping ~1.5 m within the first 10 m, 2.2 m/25 m), deeper, and swifter than the north bank, forcing ~98% of the fish to stay within 10 m of shore throughout the run.

The Kasilof River is a glacial river about 60 m wide at the sonar site when water level peaks in early August. The north bank slopes downward at about 0.6 m within the first 3 m from shore then flattens, dropping only ~0.25 m in 30 m. The south bank slope is relatively constant, dropping slightly more than 1 m in 40 m. The river bottom consists mostly of rocks 20–60 mm in diameter along both banks, although larger rocks and boulders exceeding 1 m are common along the north bank.

The Yentna River at the sonar site is very turbid, probably <15 cm (secchi disc depth) at the surface, 200–240 m wide, rising and falling up to 0.2 m daily. The river profile at each transducer site is relatively steep, dropping 4 m in 20 m on the north bank and over 3 m in the first 10 m on the south before flattening to <1 m in the next 10 m of range.

The width of the Crescent River has generally been 40 m throughout the operational period but can increase to 70 m with an increase in water volume. Crescent River bottom profiles have not been plotted. The north bank transducer is located on the inside of a gentle curve in the river where the substrate slopes away along a (intermittently) submerged gravel bar for a considerable

---

<sup>1</sup> Product names used in this report are included for scientific completeness, but do not constitute a product endorsement.

distance allowing for a counting range of 10–11 m or more at times. The south bank transducer is on the outside of the bend and across from the north bank transducer. The bank at this location slopes at a sharp angle, limiting total range to 4–5 m. The water is often >1.5 m deep immediately next to this bank.

## **FISH WHEELS AND APPORTIONMENT**

Fish wheels have been used at all sonar sites to apportion sonar counts by species when necessary and to collect morphological information such as age, sex, length (ASL) and weight data from sockeye salmon. Fish wheels were once deployed along both banks of the Kenai River and both banks of the Kasilof River, but in the mid-1980s we began using only 1 fish wheel on the north bank of each river. We have used a fish wheel on each bank of the Yentna River since we started operating there in 1986 and began using one on the south bank of the Crescent River in 1993. Two fish wheels are required on the Yentna River because of differences in the species composition along each bank. Factors influencing the accuracy of fish migration estimates for pink, coho (*O. kisutch*), chum (*O. keta*), and Chinook salmon (*O. tshawytscha*) in the Yentna River are discussed by Tarbox et al. (1981, 1983). Prior to 1993, drift gill nets and a fish trap were used in the Crescent River to capture fish for species apportionment and ASL sampling. The use of a fish wheel since 1993 made maintenance of sample gear less problematic, improved operational integrity, and provided a larger sample size.

Prior to 1999, we required a minimum fish wheel sample of 150 fish to apportion sonar counts in the Kenai River. However, during periods of low passage rates, several days were often required to attain an adequate sample size. In 1999, we began using different criteria replacing the sample size requirement ( $n=150$  fish) with a percentage of the previous days sonar count. We also stipulated that apportionment would begin only when salmon species other than sockeye exceeded 5% of the total fish wheel catch for the Kenai River and an upward trend in the catch of other salmon was imminent. We have also applied the same criteria to the Kasilof River. Altering the method by which sonar counts were apportioned to species did not significantly change the final sockeye salmon estimates ( $p<0.05$ ; S. Carlson, Commercial Fisheries Biometrician, ADF&G, Soldotna; personal communication) and was more defensible. We have always apportioned Yentna River sonar counts by bank because of the variability of run timing and species composition between banks. The apportioned counts for each bank were estimated using fish wheel catches on each bank. The same has been true on the Crescent, except sonar counts are apportioned based on catch data from one fish wheel.

## **ESCAPEMENT GOALS**

Prior to 1968, sockeye salmon escapement estimates in UCI were based on surveys of clear water spawning areas and provided no information about the distribution or number of sockeye salmon in glacially occluded waters (King and Davis 1989). Commercial and recreational fishery management efforts were further hampered by lack of daily and cumulative estimates of escapement. These constraints were significantly reduced by the development of side-looking (once referred to as side-scan) sonar techniques by Bendix Corporation to enumerate sockeye salmon in certain glacial tributaries of UCI.

Optimal escapement goals (OEG), which take into consideration both biological and allocative issues, were established by the Alaska Board of Fisheries (BOF) for late-run sockeye salmon. The OEG for sockeye salmon into the Kenai River is 500,000–1,000,000 fish and for the Kasilof

River was 150,000–300,000 sockeye salmon. The Alaska Department of Fish and Game (ADF&G) also managed for a Kenai River inriver escapement goal that was dependent upon forecasts and daily inseason evaluations of run strength. If the sockeye salmon run forecast is <2,000,000, the inriver escapement goal becomes 650,000–850,000; for a run of 2,000,000–4,000,000, the inriver goal would be 750,000–950,000; and for a run >4,000,000, the inriver goal would be 850,000–1,100,000 fish. A sustainable escapement goal (SEG), an escapement index that provides for sustained yields over a 5–10 year period, was also set for the Kenai River at 500,000–800,000 sockeye salmon (Fair et al. 2007). In 2009, the SEG for Yentna River sockeye salmon was eliminated due to uncertainty in the Yentna sonar\fish wheel escapement estimates. Instead, 3 weir-based SEGs were established for Susitna River sockeye salmon at Judd (25,000–55,000), Chelatna (20,000–65,000), and Larson (15,000–50,000) lakes (Fair et al. 2009). The biological escapement goal (BEG), which provides for the greatest potential for maximum sustained yield, was set at 30,000–70,000 sockeye salmon for the Crescent River.

## **OBJECTIVES**

We established the following objectives for UCI salmon escapement projects in 2010, which were to estimate:

1. The daily and cumulative escapement and run timing of sockeye salmon into the Kenai, Kasilof and Crescent rivers;
2. A minimum and maximum escapement range for the Yentna River;
3. Age, length, and sex compositions for sockeye salmon in each river; and
4. Differences between individual observers who counted DIDSON subsample image files during the season.

## **METHODS**

### **DIDSON OPERATIONS**

In 2010, DIDSON daily salmon escapement estimates for the Kenai and Kasilof rivers were converted to Bendix-equivalent units because escapement goals were based on Bendix counts. Run forecasts and brood tables are also based on historical Bendix counts. On the Yentna River, (DIDSON) sockeye salmon migration estimates were not used in 2010 for management because of uncertainties in species apportionment.

The DIDSON operated on 1 of 2 frequencies during the recording of each of two 10 min subsamples collected every hour. The 2 frequencies were 1.8 MHz with an acoustic beam consisting of 96, 0.3° x 14° beams with a range limit of 10 m, and 1.1 MHz with an acoustic beam consisting of 48, 0.4° x 14° beams and a range limit of 30 m. The pulse length of the DIDSON makes it difficult to field test target strengths (TS), however, a 38.1 mm calibration sphere was clearly seen in DIDSON images from early field tests (Maxwell and Gove 2007). The TS of the sphere is theoretically between -38 dB and -39 dB for each frequency when water temperature is 9° C. Laptop computers collected DIDSON data and created image files used to estimate hourly fish passage. The data were stored and backed up on external hard drives and DVDs. An automated rotator coupled with an attitude sensor assured proper aim once the transducer was deployed. DIDSON creates video-like images on a computer screen that are manually counted. Auto-counting methods have been tested for DIDSON but are not very accurate (Suzanne Maxwell, Commercial Fisheries Biologist, ADF&G, Soldotna; personal communication)

To determine the best aim, we followed the aiming protocol of Maxwell and Smith (2007). The position of the DIDSON, the nominal beam angle and range helped to calculate and graph the river profile. We overlaid a model of the sonar beam over the profile, adjusted the height of the transducer above the river bottom and estimated the best ‘fit’, or angle for the desired range of the beam. Initially, we used the calculated angle to set the rotator aim for the transducer as detected by the sensor. We have learned that unless the river bottom changes, the same beam angle can be used from year to year assuming the transducer is placed in the same location. To check the angle and aim, we moved an artificial target with an acoustic strength similar to that of a sockeye salmon along the river bottom ~2 m in front of the transducer and through the acoustic beam. Once we established a proper aim, we relied on the pitch and roll data from the attitude sensor to maintain that aim, particularly when the DIDSON had to be moved or cleaned (external sensors were mounted to the transducer which was mounted to the rotator) Silt buildup behind the DIDSON lens was a problem, so lenses were cleaned once every week on the Kenai River, once a week on the Kasilof River and once every 2 or 3 days on the Yentna River to maintain signal strength integrity and visual acuity.

We mounted all DIDSON transducers on an aluminum H-shaped stand in about 0.6 m of water and ~15 cm above the bottom in a horizontal, side-looking position on each bank. The DIDSON transducer was placed 1–1.5 m from the offshore end and immediately upstream of a short weir, which extended approximately 3–6 m into the river.

A laptop computer recorded two 10 min image files, for nearshore (0.4–10 m) and offshore (>10 m) target (fish) detection. The nearshore files, set at high frequency, usually recorded at 8 frames per second while the offshore files, using low frequency, recorded at 6 frames per second. All subsample files were saved to an external hard drive with a storage capacity of 750 GB or more and backed up on DVDs.

To process and count the raw images as quickly and accurately as possible, we used the DIDSON background subtraction algorithm, which leaves only moving fish-like objects against a black background. For counting purposes, an intensity setting of 40 dB and threshold of 4–5 dB produced the best contrast that ensured counting ease and accuracy. Playback frame rates often varied from 8 to 30 frames/s depending on fish densities and the ability to accurately differentiate fish images. Intensity and threshold were relatively constant from person to person with small variations between individuals for personal preference.

We counted all moving targets (fish) as observed on the computer screen for each 10 min file differentiating upstream ( $n_u$ ) from downstream ( $n_d$ ) swimming fish. For each frequency (and range), the number of salmon migrating upstream during the full hour ( $N_h$ ) was estimated by

$$N_h = 60 \frac{(n_{ud} - n_d)}{10} \quad (1)$$

The total hourly estimate was calculated by summing the estimates from the 2 frequencies (ranges). All hourly estimates were summed to produce the daily escapement estimate ( $N_d$ ):

$$N_d = \sum N_h \quad (2)$$

Because escapement goals for the Kenai and Kasilof rivers were based on Bendix counts and since DIDSONs were used to enumerate these escapements, we converted each daily DIDSON estimate to Bendix equivalents. Preliminary conversion factors based on a geometric mean regression were variable by bank and river (Table 1).

For the inseason adjustment, slope and intercept values from Table 1 were used to convert DIDSON estimates to Bendix equivalents,  $N_b$ ,

$$N_b = \left( \frac{\sqrt{N_d - i}}{S} \right)^2 \quad (3)$$

The Kenai River inriver goal of 650,000 is the sum of the lower end of the escapement goal (500,000) and the allocated sport fishing harvest (150,000). The escapement goal was based on Bendix counts whereas the sport fish allocation was established from actual fish in the harvest. In keeping with the original intent of the Kenai River inriver goal that the BOF set forth, we allocated 17.6% of the daily DIDSON estimate of sockeye salmon to sport fishing harvests until an allocation of 150,000 sockeye salmon,  $n_{sf}$ , had been reached

$$n_{sf} = N_d(0.176) \quad (4)$$

This percentage represents the 150,000 sport harvest allocated by the BOF, calculated by dividing the 150,000 sport harvest into the adjusted inriver goal of 850,000 [700,000 \* 1.4 (the approximate overall conversion from Bendix to DIDSON)] fish.

Next, we converted the remainder ( $N_d - N_d(0.176)$ ) to Bendix equivalents ( $N_b$ ) as shown in equation 3. Lastly, we estimated the final daily migration,  $N_d$ , past the sonar at river mile 19 sonar by:

$$N_d = n_{sf} + N_b \quad (5)$$

## OBSERVER ERRORS

We examined counting variability between 10 observers (5 from the Kenai River, 3 from the Kasilof River and 2 from the Yentna River projects). A total of 48, 10 min DIDSON files were selected from the peak of the Kenai run (15 and 19 July) and counted once by each observer. The files were taken from both banks' (1–10 m) nearshore recordings where abundance was significantly larger than offshore. In undocumented comparisons from 2009, we found differences between observers to be <5% at abundances less than 200 fish per 10 min. The abundance of fish in all 10 min files ranged from 100 to 1,000 fish with most (65%) between 200 and 600.

An average ( $\bar{x}$ ) of all individual counts was used as a baseline to compare against the averages for each observer ( $\bar{x}_i$ ). We compared  $\bar{x}$  against 1) each individual, 2) Kenai crew only and 3)

other crew. If an individual was higher than the average, we expressed the difference as a plus (+) and if below the average, a minus (-).

$$\bar{x} = \frac{\sum f}{n} \quad \text{and} \quad \bar{x}_i = \frac{\sum f_i}{n_i} \quad (6a)$$

Where:

$\sum f$  = sum of fish counts of all observers

$\sum f_i$  = sum of fish counts of an individual observer

$n$  = number of files counted by all observers

$n_i$  = number of files counted by an individual observer

and the difference (d) from this average was measured for each observer and compared to the average of all individual subsample counts, where

$$d = \bar{x}_i - \bar{x} \quad (6b)$$

$$d_{\%} = \left( \frac{\bar{x}_i}{\bar{x}} \right) 100 \quad (6c)$$

We stratified fish abundances to compare or correlate differences between observer (subsample) counts at different passage rates. To do this, the average count by abundance strata for each observer was compared to the average for other observers for each file (6a). We also calculated standard deviation and  $R^2$  values by comparing individual counts with the average counts for other observers.

## **BENDIX OPERATIONS**

In 2010, the Crescent River sockeye salmon migration was estimated using Bendix Corporation, single beam, side-looking sonar counters (1978 and 1980 models) as described by King and Tarbox (1989), Gaudet (1983), and Bendix Corporation (1980 and 1984). The Bendix counters have a fixed pulse width of 100 $\mu$ s, use a 515 kHz transducer either multiplexed in an alternating mode between 4° for offshore detection and 2° for nearshore detection, or on a single beam. The counting threshold was preset by the manufacturer at approximately -38 dB but swimming pool tests with a standard target (-41 dB) typically saturated the counters at normal voltage output levels (Westerman and Willette 2010). Theoretical TS's for Bendix of a 38.1 calibration sphere is -43.2 dB (Maxwell and Gove 2007).

We aimed the Bendix transducers manually on both banks (tilt only). We tested the aim by moving an artificial target (a sealed, weighted plastic sphere with a target strength approximating

that of an adult salmon) along the river bottom and through the ensonified area at various, (reachable) distances from the transducer. We verified the counter's detection of the target with simultaneous visual recognition on an oscilloscope. Our transducer placement from (and along) shore has been relatively consistent from year to year. Placement was dependent upon substrate, water depth, and velocity in an area where >80% of the fish passage occurs within the nearshore half of the ensonified area (counting range). We placed short weirs (<6 m wide) immediately downstream of the transducer to prevent fish from passing behind or too close to the transducer, ensuring that fish pass through the sonar beam.

The Bendix transducers convert electronic signals into an acoustic pulse transmitted from the transducer, through the water along the river bottom. Any object, or target, that passes through this acoustic pulse or 'beam' will return an echo to the counter for electronic interpretation. Before a target can be counted as a single 'fish' by the Bendix counter, the echoes must meet or exceed a set threshold, fixed 'hits to count' criteria and ping rate (pulse repetition rate) that matches the swimming speed of fish. We counted targets by observing returning echoes displayed on an oscilloscope, then compared our manual count to the Bendix count and adjusted (calibrated) the ping rate until relative error was less than 10% was achieved. Our calibrations lasted 10 minutes or until we attained an oscilloscope count of at least 100 fish, whichever came first. If the counters counted less than what we observed on the oscilloscope, we increased the ping rate, and conversely slowed the rate if the counters over-counted. Undercounting or over-counting depends upon the time a fish spends in the acoustic beam of the transducer. We calibrated the counters between 0700 and 0100, approximately 2 hours/day, intensifying our efforts during episodic periods of high fish passage.

The power output or receiver sensitivity, critical in target detection, was set early in the run, at a typical historical level and was not adjusted for calibration purposes. If we extended or shortened the counting range substantially, sensitivity was adjusted up or down to improve target detection if necessary. The sensitivity for each counter is set to maximize detection of migrating fish but limit background noise that can hinder target detection. The spatial distribution of fish from the transducer, based upon sector counts, determined the best counting range.

Occasionally we observed false counts caused by river debris stuck in the sonar beam for extended periods of time, bottom noise (rocks), or by spawning salmon holding in the beam. When this occurs, the additional counts are included in the Bendix data output, but because an object or a salmon, fixed in the beam causes the counts to increase dramatically, the false counts are easy to detect. The Bendix output is divided into 12 sectors and printed each hour (sector-hour counts). Usually when an object holds in the beam, only a single sector or small group of sectors is affected. Sectors may be affected for only an hour or they may span several hours, depending on the aim and type of debris. Sector counts for each hour were examined by technicians after entering them into a Microsoft Excel spreadsheet and if false counts were detected, they were removed and replaced by an (automated) interpolated count. Interpolated counts for each sector were obtained by averaging all valid counts for that sector(s) for the day. A valid count means that fish are being counted as close to 1 for 1 (within 10%) as shown by the counter and oscilloscope. If equipment failure was the cause of missing hourly counts, we treated the missing data the same as debris, and inserted interpolated numbers into the missing hours.

When the false counts were deleted and annotated as debris, the program automatically inserted the average or interpolated number into the corrupted sector(s). After interpolating missing values, hourly (and sector) sonar counts were summed to estimate total daily escapement.

## **FISH WHEELS**

Fish wheels were used on the north banks of the Kenai and Kasilof rivers, both banks of the Yentna River and south bank of the Crescent River to catch fish for ASL information and to apportion sonar estimates to species. All fish wheels used in UCI were of similar design consisting of framework that supports aluminum or foam-filled plastic floats, an axle and live box. Mounted to the axle are 2 baskets and 2 paddles, at 90° angles to each other, which rotate by the force of the river current. As the axle rotates in the current, the baskets scoop fish from the river and drop them in a live box mounted to the outside of the fish wheel frame. The baskets were fitted with 2–2½ in (5–6 cm) tarred netting and a slide, which funneled the fish toward an opening in the basket netting and into the live box. The live box was mostly submerged in the river, where a constant flow of freshwater kept fish alive and vigorous. All fish wheels were anchored to shore using a boom (either a wooden or steel 4 x 4) to station the wheel in current deep and fast enough to allow the axle to turn the paddles and baskets. The baskets rotated as close to the bottom as possible where most fish migrate, turning freely without jamming into the bottom. Cables or rope secured the front end to shore and kept the fish wheel parallel to the current. Spinning speed of the fish wheel ranged between 2 and 5 revolutions per minute (rpm) with optimum speed being 3–4 rpm (any slower or faster reduced its effectiveness). A short weir, 3–6 m wide (depending on river) with pickets spaced no more than 7 or 8 cm apart, extended from shore diverting near shore fish toward the spinning baskets. The weirs extended toward shore and were aligned with or just downstream of the axle. At some sites it was practical to extend the weir immediately below the wheel, past the inshore float, to prevent fish from passing under the fish wheel float and missing the catch zone.

In 2010, we positioned the Kasilof River fish wheel under the Sterling Highway bridge for the first 3 weeks of operations after which we relocated it 30–40 m upriver when the water level was higher. We were able to fish the wheel more effectively from start to finish and meet our needs for ASL analysis, although the CPUE was less than average in 2010. We often operated the fish wheel 18–24 h per day but the most efficient time for catching fish was late evening and night; few fish were caught during the day.

## **APPORTIONING SALMON MIGRATION AND AGE COMPOSITION**

We operated fish wheels at all UCI sonar sites to 1) apportion sonar counts by species when necessary and 2) collect ASL information. We do not apportion the Kenai or Kasilof River sonar counts to species until fish wheel catches meet our criteria for apportionment. Apportioning starts in the Kenai and Kasilof rivers when the fish wheel species composition contains at least 5% pink and/or coho salmon and in our best judgment is a trend over more than one day. This guideline was developed to accommodate situations where run timing of sockeye and pink salmon (and sometimes coho salmon) overlap, usually during even-numbered years. Fish wheels were run throughout the day and night when catch rates were low and were not stopped unless an adequate sample size was collected; minimum sample sizes were 0.1% of the previous day's sonar estimate for the Kenai River and 0.2% for the Kasilof River. We apportioned the sonar estimates for the Yentna and Crescent rivers because of the high numbers of pink, chum, and coho salmon in the daily fish wheel catches. We also used fish wheels to recapture tagged

salmon and collect tissue samples for genetic analysis from Yentna River salmon. In 2009 and again in 2010, the first and second years of a 4-year fish wheel selectivity study, we operated each of the Yentna fish wheels for nearly 18 h/d during 3 time periods; 0600–1200, 1200–1800, and 1800–2359 hours (prior to the study, fish wheels operated about 6 h/d). At Crescent River, we operated the fish wheel during periods of high fish passage which usually coincided with high tides until 0.5% of the previous day’s sonar count was caught.

At Kenai, Kasilof, and Crescent rivers, the escapement of each salmon species,  $N_x$ , was estimated by multiplying the daily Bendix equivalent ( $N_b$ ) by the daily percentage of each species captured in the fish wheels, i.e.,

$$N_x = N_b \left( \frac{F_x}{F_t} \right) \quad (7)$$

where  $F_x$  was the daily catch of species x and  $F_t$  was the total daily salmon catch in the fish wheel.

The abundance of non-salmon in fish wheel catches, such as rainbow trout and whitefish, was small (<1%), so these fish were not apportioned from the total sonar count. However, relatively high abundances (~5–10%) of Dolly Varden were apportioned from the Crescent River counts, because their lengths were similar to salmon.

When the fish wheel catch was low or we did not operate during a 24-h period, we combined the low fish wheel catch with the 2 previous day’s catches to calculate  $F_x$  and  $F_t$ .

We think Yentna River fish wheels have been species selective, so we calculated 6 escapement estimates for each species of salmon using fish wheel selectivity coefficients (Table 2) estimated on the Susitna (ADF&G 1983) and Taku rivers (Meehan 1961). A seventh estimate was derived using the actual unadjusted fish wheel catch.

From these 7 estimates, we identified the minimum and maximum to determine the escapement range for each species. The selectivity-adjusted daily escapement of each salmon species ( $n_{rs(i)}$ ) was estimated by

$$n_{rs(i)} = \left( \frac{\frac{F_{(rs)}}{C_{i(rs)}}}{\left( \frac{F_{(rs)}}{C_{i(rs)}} \right) + \left( \frac{F_{(ps)}}{C_{i(ps)}} \right) + \left( \frac{F_{(cs)}}{C_{i(cs)}} \right) + \left( \frac{F_{(ss)}}{C_{i(ss)}} \right)} \right) N_d \quad (8)$$

where:

$F_{(rs)}$  = daily fish wheel catch of sockeye salmon,

$F_{(ps)}$  = daily fish wheel catch of pink salmon,

- $F_{(cs)}$  = daily fish wheel catch of chum salmon,  
 $F_{(ss)}$  = daily fish wheel catch of coho salmon,  
 $C_{i(rs)}$  = the  $i$ th fish wheel selectivity coefficient for sockeye salmon,  
 $C_{i(ps)}$  = the  $i$ th fish wheel selectivity coefficient for pink salmon,  
 $C_{i(cs)}$  = the  $i$ th fish wheel selectivity coefficient for chum salmon, and  
 $C_{i(ss)}$  = the  $i$ th fish wheel selectivity coefficient for coho salmon.

## **CESSATION CRITERIA**

We ended operations on the Kenai, Kasilof and Crescent rivers when daily estimates or counts met our cessation criteria, which was <1% of the total cumulative count of sockeye salmon for 3 consecutive days. The cessation criteria for the Kenai and Kasilof River sonar enumeration projects could not be applied until after August 15, when commercial fishing closed in the Kenai, Kasilof and East Forelands sections. We have made exceptions to this criterion if budgetary constraints and/or environmental factors such as high water put equipment or personnel at risk, and the end of the run is near and close to the 1% cessation criteria.

## **AGE, SEX AND LENGTH DATA**

Sample sizes for estimating ASL compositions were 0.1% of the previous day's sockeye salmon escapement estimate on the Kenai River, 0.2% on the Kasilof River, and 0.5% on the Crescent River. A single scale for age analysis was collected from a preferred area on the left side of each fish, on a line between the posterior edge of the dorsal fin and anterior portion of the anal fin about 2 or 3 scale rows above the lateral line. If the preferred area was scarred or void of scales, the scale was either taken in front of the preferred area or from the same spot on the right side of the fish. Lengths were measured from mid eye to fork of tail (MEFT). The sampling plan for the Yentna River fish wheel study required collecting ASL information and genetic samples from every sockeye salmon captured in the north bank fish wheel and from every sixth sockeye salmon captured in the south bank fish wheel during each of three 2 hr (genetic) sampling periods. We also measured total lengths (snout to fork,  $n=400$ ) of pink, chum, and coho salmon captured in the Yentna fish wheels.

## **STREAM SURVEYS AND WEIR COUNTS**

We conducted a stream survey on Quartz Creek in late August and Ptarmigan Creek in early September to get an indication of the strength of escapements into Upper Kenai River tributaries. We walked each stream once during the historical peak of spawning activity. The Quartz Creek survey covered the lower 7.5 km of the creek, starting at the Matanuska Electric Association substation on the Sterling Highway and ending at Kenai Lake. The Ptarmigan Creek survey covered the lower 2.5 km of the creek ending at Kenai Lake. We counted all living and dead sockeye salmon and other species of salmon. This information was added to a table including the Russian River weir counts provided by the Division of Sport Fish and Hidden Creek weir counts provided by the Cook Inlet Aquaculture Association (CIAA). CIAA also conducted weir counts at Judd, Chelatna, Larson Shell, Sucker, and Whiskey Lakes. It should also be noted that stream surveys (aerial and ground) were conducted on a number of northern district streams and lakes by ADF&G (Division of Sport Fish, Palmer).

## CLIMATOLOGICAL

We collected water and air temperatures, depth (staff gauge), and noted general weather conditions at each of the sonar sites. Because of varying water clarity, we also recorded turbidity (secchi disc) every day in the Kenai and Crescent rivers. We did not measure turbidity in the Kasilof and Yentna rivers.

## RESULTS

### KENAI RIVER

The final Kenai River escapement estimate (Bendix equivalent) of 970,662 sockeye salmon (96.9%) was the eleventh highest since 1978 (Table 3). We apportioned 18,876 pink salmon (1.9%), 7,935 coho salmon (0.8%), and 3,727 Chinook salmon (0.4%) from the total salmon estimate (Table 4). We reached the sport fish allocation of 150,000 sockeye salmon on 26 July. See Appendices A1–A2 for daily estimates by bank and Appendices A3–A4 for DIDSON daily subsample counts.

The midpoint of the escapement migration occurred on 21 July (Table 5), 2 days earlier than the historical average. One substantial peak occurred on the 19 July when ~83,000 sockeye salmon passed the counters (Figure 3) with 2 lesser peaks occurring 25 July (~41,000) and 3 August (~36,000). Run timing was similar for both banks with no substantial bank preference (~51% north bank) throughout the migration (Table 6).

Fish migrated farther from shore along the north bank, likely because of the shallow water and slower current along this side of the river, and they moved closer to shore as the river rose. The river is deeper and swifter on the south bank so fish migrated closer to shore during the entire season. Subsample counts indicated 87% of the fish (Table 7) along the north bank and 98% of the fish on the south bank migrated within 10 m of each transducer. About 60–80% of the fish were observed 10–30 m from the north bank transducer during the first week of July, but by 12 July about 80% of the fish were within 10 m.

The daily trends in hourly passage rates were relatively similar between the north and south bank. Fish passage was at its highest during evening hours, declining substantially after midnight until about 0400 or 0500 when the rate started to increase (Figure 4). Salmon passage rates along the north bank met or exceeded the overall average daily rate of 4.2% (the average % hourly passage rate for a 24-hr period) between 1600 and 2300 (~49% of the average daily estimate) and were lowest throughout the morning hours. A similar pattern of fish passage occurred on the south bank, meeting or exceeding 4.2% between 1300 and 0000 when ~62% of the fish migrated past the counter (Appendices A5–A6).

The Kenai River fish wheel catch (Table 8) consisted mostly of sockeye salmon (90.2%) with a pink (5.9%), coho (2.6%) and Chinook salmon (1.3%) intermixed. Pink and coho salmon were more abundant in the catch in August. The high percentage of sockeye salmon was slightly above average whereas the percentage of pink salmon was relatively low (Table 9) for an even-numbered year.

We sampled 855 sockeye salmon for ASL analysis out of a fish wheel catch of 2,002 fish (Table 10). The predominant age components of the sockeye salmon escapement were 1.3 (44.4%), 2.3 (23.9%), and 1.2 (23.4%). The average length for all age classes was 543 mm which was within

the historical range of 481–576 mm; male-to-female ratios were slightly <1:1 for all age classes, also consistent with historical ratios. (Table 11).

DIDSON subsample count comparisons were made between observers from the Kenai ( $n=5$ ), Kasilof ( $n=3$ ), and Yentna River crews ( $n=2$ ). Individual observer counts were highly correlated with the average count from all observers, with  $R^2$  values ranging from 0.94 to 0.99 ( $SD=12$ ; Table 12). The correlation was higher among the Kenai River crew members ( $SD=18-92$ ) than it was among individuals from other crews ( $SD=19-131$ ) not accustomed to counting Kenai River image files (Table 13). The differences among all observers gradually increased as fish densities increased. The differences among observers were smallest ( $SD=19$ ) at fish densities <199/subsample and greatest at fish densities of 900–999 fish/subsample ( $SD=131$ ).

Weir counts and stream surveys from the upper Kenai River totaled 104,289 sockeye salmon, 10–11% of the estimated sockeye salmon migration past RM 19. The total Russian River weir and stream survey count was 55,504 sockeye salmon and the Hidden Lake weir count was 41,503 (Table 14).

The Kenai River, a glacially occluded river, rose between 1 July and 15 August 2010 (0.4 m), peaking in early August (Table 15; Figure 5). The water was clearer than most years and remained that way during much of the migration. The summer was mostly cloudy and rainy which kept air and water temperatures slightly cool.

## **KASILOF RIVER**

The final 2010 sockeye salmon escapement estimate (Bendix equivalent) for the Kasilof River was the lowest since 2002. Our final estimate was 267,013 sockeye (98.7%), 1,800 pink (0.7%), 301 coho (0.1%), and 1,499 Chinook salmon (0.6%; Table 16). Beginning 7 August, sonar counts were apportioned by salmon species because of high fish wheel catches of pink salmon. See Appendices B1–B2 for daily (Bendix equivalent) estimates by bank and Appendix B3 for daily DIDSON subsample estimates by bank.

The midpoint of the migration occurred on 16 July (Table 17), 1 day later than the historical average (1979–2009). One substantial peak, estimated at 22,498 sockeye salmon, occurred on 17 July (Figure 3) and lesser peaks exceeding 9,000 fish occurred on 23 and 24 June. Approximately 70% of the fish were estimated along the north bank which was nearly 15 percentage points higher than the historical average (1979–2009; Table 6).

Fish migrated farther from shore (10–30 m) in late June and early July, but as water level slowly increased, they moved inshore in late July and August (Table 7). By the second week of July, >90% of the fish were passing within 10 m of the transducer along the north bank and 80% within 10 m of the south bank transducer. By 21 July, >95% of the fish were within 10 m of the transducer on both banks. For the entire season, 96% of the fish on the north bank and 83% of the fish on the south bank were within 10 m of the transducer.

Hourly run timing patterns within each day differed between banks (Figure 4). The migration along the north bank tended to increase through the evening hours and declined substantially after midnight. The migration along the south bank was greatest during mid to late morning hours, varied throughout the day, and then declined during afternoon and evening hours. We counted 70% of the migration along the north bank between 1000 and 2400 hours when counts met or exceeded a constant hourly passage rate of 4.2%. We counted ~59% of the fish along the

south bank between 0200 and 1200 hours, and between 1600 and 1700 hours (Appendices B4–B5).

We caught a total of 1,533 sockeye salmon (97.4%) in the fish wheel with a few pink (1.1%) and Chinook salmon (0.2%) intermixed (Table 18). The CPUE (1.8 fish/h) was one of the lowest since operations began at the site in 1983 (Table 19). We sampled 477 sockeye salmon to estimate ASL compositions. Age 1.3 (31.2%), 2.2 (31.2%), and 1.2 (27.7%) were the dominant age classes (Table 20). Average lengths for all age classes ranged between 468 mm and 534 mm and the male to female ratio was relatively low (0.7:1) for this river (Table 21).

Water temperatures were slightly cooler than average and the water level rose 0.9 m during the project period (Table 15). Environmental factors did not appear to influence inriver salmon run timing although water level influenced fish distribution and fish wheel operations.

## **YENTNA RIVER**

We estimated 59,399–145,139 sockeye, 35,044–153,363 pink, 41,657–103,462 chum, and 39,200–196,094 coho salmon migrated past the Yentna River sonar site (Table 22). These estimates were derived using DIDSON to estimate the escapement of all salmon species past the sonar. Fish wheel catches were used to apportion the total salmon escapement to different salmon species. Escapement ranges were estimated by applying 6 sets of fish wheel selectivity coefficients taken from previous studies.

We estimated that the midpoint of the sockeye salmon run occurred on 23 July, 1 day earlier than the historical (1981–2009) average (Table 23). Estimates for both banks showed a distinct peak in the run on 22 July and several lesser peaks on 17 and 28 July and 1 and 4 August (Figure 6). The peak along the north bank occurred on 1 August while the south bank peaked on 22 July. Pink salmon estimates peaked on 1 August, chum salmon on 1 August, and coho salmon on 20 July.

From the range estimates, 4–5 times more sockeye, 2–3 times more chums, and about 3 times more coho were counted along the south bank than the north bank, which is typical for the Yentna River (Appendices C1–C2). Daily run timing trends between banks were similar except more (~80%) fish migrated along the south bank (Figure 6). The highest passage rates occurred along the north bank during the hours 1500 through 0300 (64%) and along the south bank between 1000 and 2200 hours (63%; Figure 7, Appendices C3–C4). Salmon migration was shore-oriented on both banks throughout the season (Table 7) with ~94% of all fish passing within 10 m of the transducers on both banks. The nearshore (1–10 m) percentages were slightly lower for the first week of operations but increased and remained consistent by the second week of the season.

The south bank fish wheel catch per unit effort (CPUE) was substantially larger than the north bank fish wheel catch (Tables 24–27) which has been typical for the Yentna River. The north bank fish wheel CPUE averaged 15.1 salmon per hour and consisted of sockeye (13.6%), pink (58.7%), chum (13.5%), and coho salmon (14.0%). The CPUE for the south bank fish wheel averaged 25.7 salmon per hour and consisted of sockeye (24.5%), pink (43.4%), chum (16.3%), and coho salmon (15.8%). Chinook salmon consisted of <1% of the catch for both fish wheels.

The age composition of Yentna River sockeye salmon consisted mostly of 1.2 (39.4%), 1.3 (23.3%), 0.2 (12.5%), and 2.3 (11.5%; Table 28). The overall age composition showed a higher incidence of 2-ocean fish over 3-ocean fish, with the highest incidence of age-0.2 fish ever

documented and the lowest percentage of age-1.3 fish (23.3%) since 1983. The average lengths for all age classes ranged between 468 mm and 556 mm and the male to female ratio was >1:1, consistent with historical ratios for this river (Table 29).

Weir counts were within respective SEG ranges at Chelatna (20,000–65,000) and Larson lakes (15,000–50,000), while the escapement into Judd Lake was below the SEG range (25,000–55,000). The total escapement for Chelatna, Judd, and Shell lakes was 58,317 sockeye salmon (Table 30), approximately 40% of the upper estimate and 98% of the lower estimate (59,399–144,949) of the sockeye salmon migration past the Yentna River sonar site. The Chelatna Lake escapement was nearly 65% of these weir counts.

Water temperatures were below average for the Yentna River in 2010 (Table 15). Water level fluctuated up to 1.4 m (Figure 8) during operations, rising when rains fell in the mountains in appreciable amounts or when warm, sunny weather melted the glaciers. Overcast days with little or no precipitation usually caused the water level to drop. Although we didn't measure turbidity, water turbidity is estimated at just a few centimeters.

## **CRESCENT RIVER**

We estimated 86,333 (93.5%) sockeye, 1,061 (1.1%) pink, 3,470 (3.8%) chum, and 52 Chinook salmon and 1,385 (1.5%) Dolly Varden char migrated past the Crescent River Bendix sonar between 24 June and 5 August (Table 31). Sockeye salmon accounted for 67% of the estimated return of 128,000 fish to the Crescent River. Estimates for pink, chum and Coho salmon should not be considered good indicators of run strength because these fish likely continued to enter the river after the project terminated.

The midpoint of the run occurred on 10 July, 7 days earlier than the average for 1984–2009 (Table 32). There were several distinct peaks in the sockeye salmon run. The biggest peaks occurred on 26 and 28 June when we counted >4,000 sockeye salmon and another distinct peak occurred on 11 July when >3,900 sockeye salmon passed the counters (Figure 98). We frequently counted >2,000 fish per day between 24 June and 24 July. Daily run timing (per 24 h period) for both banks was similar except for some variation in mid-July. Fish movement along each bank was evenly distributed with 52% of the fish migrating along the north bank (Table 6; Appendix Tables D1–D2). The peak hourly migratory rates for both banks occurred during the afternoon and evening hours, increasing late in the morning then declining late in the evening. During this time of day we counted 67.5% of the fish (Figure 7) along the north bank and 83.9% along the south bank.

The sonar counters were located near Cook Inlet (RM 1.5) and were often influenced by the tide cycle. In June and July, most (>80%) daily peaks usually followed high tides by 3–6 hours during late morning, afternoon, and evening hours (Figure 8; Appendices D3–D4).

The fish were shore oriented along both banks with ~96% of the counts within the first 3 m of the north bank transducer and ~95% of the counts within the first 1 m of the south bank (Table 7). The counting range varied between 7.6 m and 11.6 m on the north bank and between 4.0 m and 4.9 m on the south bank (Appendices D5–D6).

The Crescent River fish wheel captured 1,815 sockeye salmon (93.3%) out of a total catch of 1,945 fish (Table 33). The high proportion of sockeye salmon in the fish wheel catch is the third highest since we began using a fish wheel in 1993 (Table 34). Pink (1.0%) and chum salmon (4.2%) were beginning to show in the fish wheel catch the last week of July and Dolly Varden

char (1.5%), ranging between 350 mm and 550 mm in length, were present throughout much of the project period.

We estimated the age composition for sockeye salmon to be mostly 1.3 (37.5%), 2.3 (36.4%), 2.2 (15.1%), and 1.2 (10.4%; Table 35). The average lengths for all age classes ranged between 479 mm and 559 mm and the male-to-female ratio was <1:1 for the major age classes, consistent with historical ratios for this river (Table 36).

Average water temperature of the river in 2010 was 2.4 °C colder than the historical average (Table 15). Although water level fluctuated during the operational period, the range from lowest to highest was about average for the river (Figure 8). The Crescent River was relatively clear in 2010 which may have influenced the fish wheel CPUE, because there were times when catches were low, sonar counts moderately high and water relatively clear.

## **DISCUSSION**

The conversion from DIDSON estimates to Bendix equivalents for the Kenai and Kasilof rivers was necessary, because sonar comparison studies (Bendix and DIDSON) conducted in recent years found significant differences between counts from the 2 sonars (Maxwell et al. 2011). Escapement goals had not been adjusted in 2010 to compensate for the differences between the sonars; therefore, DIDSON counts were adjusted to Bendix equivalents for inseason management of the fisheries.

Conditions were adequate for using sonar to estimate salmon escapement in each of 4 river systems in UCI because 1) high water did not inhibit operations in 2010; 2) most sockeye salmon migrated near shore (<10 m) and near the bottom within range of a transducer beam; 3) salmon densities were not overwhelming, allowing for Bendix calibrations or processing of DIDSON files to be completed in a timely and accurate manner; and 4) the acoustic size of migrating fish were within detection thresholds of the sonars. We have found that the target strengths of migrating salmon in other systems were within the thresholds of Bendix counters and DIDSON. For instance, tracked fish (similar to the lengths of fish migrating into UCI systems) averaged -32.2 dB in the Copper (Maxwell and Gove 2007) and between -32.0 and -32.4dB in the Yentna rivers (Tarbox and King 1991). These TS were well within the minimum thresholds for DIDSON, which can easily detect calibration spheres of -38.1 dB, and Bendix sonar (-43 dB).

### **KENAI RIVER**

The Kenai River estimate exceeded the maximum inriver goal of 950,000 sockeye salmon, a goal based on a Kenai River run of 2–4 million fish. The sockeye salmon inriver run estimate for the Kenai River accounted for about 29% of its total run of 3.4 million. The largest documented counts occurred in 1987 (the Glacier Bay oil spill, 1.6 million fish) and 1989, (the Exxon Valdez oil spill, 1.6 million fish) when commercial fishing was restricted for part of or all of the fishing season. A much more restrictive management plan prevented the harvest of excess fish in these parent years and increased escapement.

In 2008, the Alaska Board of Fisheries approved an allocation of 150,000 Kenai River sockeye salmon for an inriver sport fishery. Since the 2010 DIDSON escapement estimate was converted to Bendix equivalents (DIDSON = ~1.4 x Bendix), ADF&G determined that the inriver allocation should be counted in DIDSON units, because using Bendix units would have put about 60,000 more fish into the river than required by regulation.

Sockeye salmon was the predominant species in the fish wheel catch and is typically >85% of the catch during even-numbered years (except for 2004 when 75% were sockeye salmon). In odd years the percentage of pink and sometimes coho salmon in the daily fish wheel catch will exceed 5% late in the season (August). Counts of species other than sockeye salmon have limited value as indices of total passage, because (1) their run continues beyond the operational time frame of the project, and (2) they sometimes migrate offshore of the fish wheel (Chinook salmon) and beyond the sonar range. Many of the fish observed beyond 20 m on the south bank were likely Chinook salmon, based on the size and swimming behavior observed in DIDSON images.

In 2010, the proportion of freshwater age-1 (~68%) and age-2 (~31%) sockeye salmon fell within historical bounds for the Kenai River, but the proportion of freshwater age-2s was the second highest since 1995, indicating an unusually high number of juveniles reared for an additional year in freshwater lakes. About 98% of the sockeye salmon in the 2010 migration were from the 2004–2006 brood years when escapements exceeded 1.3 million fish each year, ranking among the top 5 highest escapements since we began enumerating salmon with sonar. This high proportion of holdovers in freshwater may have been a result of intraspecific competition for the food source and/or environmental conditions (DeCino and Edmundson 2003).

In 2010, we compared subsample counts of individual observers to determine if observers were within 5% of the group average. In past undocumented comparisons, differences between observers were less than 5% at passage rates less than 200 fish per 10 min sample so most files selected for this comparison analysis (>85%) exceeded 200 fish/h (about 23% of the files ranged between 700–1,000 fish per 10 min sample). Five of the observers were Kenai River sonar crew members whereas the other 5 were from the Kasilof or Yentna River crews. Our results indicated the Kenai crew was less variable than other crew members when counting Kenai River files. We think this is because of familiarity from extensive experience counting the higher densities of fish.

The late run escapement of sockeye salmon fell within the SEG for the Russian River (30,000–110,000). The final escapement count through the Russian River weir was one of the lowest since the early 1980s. We think the survey counts for Quartz and Ptarmigan creeks were conservative, because 1) numerous fish were observed at the mouth of each creek, 2) any fish in water >1.5 m deep were difficult or impossible to see, and 3) we can't reliably account for early (or late) spawning activity. Relationships ( $R^2$  values < 0.25) between combined survey/weir counts and our sonar estimates have never been very good (Westerman and Willette 2010).

We did not notice any obvious environmental effects on daily run timing, but the effects on fish distribution from shore were obvious. We think fish are distributed farther offshore on the north bank, because of the bottom profile and shallow water. As the water rose, fish migrated in a narrow corridor along the banks of the river. Fish migrated closer to the south bank, because of deeper and swifter water. When water level rises, especially at an accelerated rate, water clarity decreases. Water clarity affected fish wheel efficiency more than sonar operations, particularly during the day. If visibility was limited by murky water then fish became more susceptible to capture.

## **KASILOF RIVER**

This was the first year we used DIDSON to estimate fish passage in the Kasilof River. The escapement of sockeye salmon into the Kasilof River fell within the OEG range. The highest documented escapement occurred in 2004 when over 577,000 sockeye salmon passed the counters.

In the 1980s and early 1990s, daily sonar counts were apportioned by species. We realized that run timing, counter limitations and spawning locations relative to the sonar site made apportioning sonar counts for pink, coho, and Chinook salmon imprecise and impractical. The run of pink salmon into the Kasilof River has always been a very small proportion of the fish wheel catch (~1–2%). Coho salmon enter the river in August and may migrate far enough offshore to avoid capture. Fish wheel and sonar limitations, river current, spawning activity in the area of sonar operations and depth may be factors influencing early and late run Chinook apportionment. We think the ratio of Chinook to sockeye salmon captured by the fish wheel and enumerated by the sonar counters (spawning activity) could have been biased during the years we apportioned daily sonar counts, especially during the latter part of the run, resulting in total Chinook estimates that exceed the actual spawners. We stopped apportioning daily counts in the late 1990s because we think the error associated with the apportionment of sockeye salmon was more acceptable than an inflated Chinook estimate. For this reason we do not use the percentage of Chinook salmon to initiate the apportionment process. Instead, we adopted the same criteria used on the Kenai River to apportion sonar estimates by species.

Some of the highest escapements into the Kasilof River were counted during the parent years (2004–2005) of the 2010 sockeye salmon run. The abundance of age-1.3 fish in 2010 was slightly below the historical average, whereas the abundance of age-2.2 sockeye salmon was substantially higher than average suggesting that some fry from those parents years may have stayed in freshwater an extra year.

The fish were more susceptible to fish wheel capture during the evening and night time hours. We're not sure why CPUE is lower during daytime hours but think any one or a combination of environmental factors, such as river velocity or substrate, may be the reason. Water level and current velocity affect fish wheel operations, turning the axle faster as the water level rises and velocity increases. There were times when the fish wheel spun too fast often tossing fish back into the river instead of dropping into the live box. Efforts to slow the spin speed had limited success. In other glacial rivers, fish wheel CPUE is comparatively higher than on the Kasilof River.

Environmental factors had no obvious effect on daily run timing but did effect fish distribution from shore. As water level rose, water velocity increased so fish took the path of least resistance nearest shore on both banks. Although we do not plot precise fish distribution from shore, fish ran closer to the north and south bank after mid-July when the water was at or near peak flow for the summer. The subsample counts show <5% of the fish were observed beyond 10 m after mid July for both banks.

## **YENTNA RIVER**

In 2010, the Yentna River sockeye salmon escapement was not estimated inseason for management purposes because of uncertainties associated with fish wheel selectivity. In 2009,

the Bendix-based Yentna sockeye salmon SEG was replaced with 3 new weir SEGs (Fair et al. 2009) for Chelatna (20,000–65,000), Judd (25,000–55,000), and Larson lakes (15,000–50,000).

We have not considered the final apportioned escapement estimates for other salmon to be representative of true run strength, because the time frame for operating the sonar project was set to match sockeye salmon run timing and not the run timing of the other species. However in 2010, the sonar project was run until 15 August at which time each species was at 1% of their total run. So, our sonar escapement estimates should be indicative of run timing for all species. Factors influencing the accuracy of escapement estimates for pink, coho, chum, and Chinook salmon in the Yentna River have been discussed by Tarbox et al. (1981, 1983).

The effectiveness of operating a fish wheel on the Yentna River can be influenced by several environmental factors such as river size, depth, bottom profile, substrate type, current, turbidity, and fish behavior as well as nonenvironmental issues such as landowner and land use. Sockeye, pink, chum, and coho salmon are generally bank oriented, but it is possible that each species may be segregated from each other to some extent. If pink salmon for example, swim nearer shore, they may be more susceptible to fish wheel capture than larger fish that pass farther from shore. Peculiarities like this might increase or decrease the capture probability for each species violating our previous assumption of equal capture probability among species. Species selectivity might also be site-specific. For instance, a higher percentage of sockeye, coho and chum salmon were caught in the south bank fish wheel in 2010 than the north bank, while more pink salmon were caught in the north bank. This difference is consistent with historical fish wheel catches (note: moving the fish wheel(s) to a more suitable location is not practical because of the river's braided channel and land ownership issues).

We have examined fish wheel efficiency in relation to our Bendix sonar counts and concluded that when the water level increased, sonar counts often decreased. Davis (1997) found that the Yentna River south bank fish wheel efficiency was high when Bendix sonar counts were low suggesting that the south bank counter was undercounting. Westerman and Willette (2007a-b) found that fish wheel efficiency was significantly positively correlated ( $p < 0.05$ ) with water level in 4 years (2002–2005) on the south bank and in 2 of 4 years on the north bank. These patterns were consistent with changes in fish behavior during periods of high water which caused fish to be more vulnerable to entrapment by the fish wheel. Yentna River water level frequently fluctuates 5–10 cm every day, and during extensive rainy periods, the river can rise up to 1 meter. Variable water level could affect the species selectivity of fish wheels, because all fish likely travel closer to shore during high water to avoid stronger currents offshore. Since all species may be more vulnerable to capture under these conditions, species selectivity may be lower.

In 2009 and 2010, we conducted several studies aimed at improving our abundance estimates of sockeye salmon migration in the Yentna River. One was a tagging study to estimate the species selectivity of the Yentna fish wheels using methods similar to Meehan (1961). A second study involved investigating errors in our total DIDSON salmon abundance estimates resulting from fish passing beyond the beam offshore and above the beam nearshore. This study will allow us to examine changes in the onshore-offshore distribution of salmon of different sizes in relation to water level and other factors. A third study was conducted to determine whether we can apportion total DIDSON salmon estimates to species or groups of species using fish lengths measured from DIDSON fish images.

Pink, sockeye, chum, and coho salmon were tagged in the lower Susitna River (Flathorn Station) and recaptured in the Yentna fish wheels as part of a fish wheel selectivity study started in 2009. This study was designed to test for differences in recapture probability among species and over time. If we find that recapture probabilities vary over time, then we will attempt to model recapture probabilities in relation to water level and salmon abundance, etc. On the Taku River, Meehan (1961) examined fish wheel species selectivity and found that fish wheels were more efficient at capturing smaller Chinook and pink salmon and, less efficient at capturing coho and larger Chinook salmon. In 1981 and 1982, ADF&G (1983) found that fish wheels on the Susitna River at Talkeetna and Curry Stations selected more for pink salmon and less for chum and Chinook salmon, with no apparent selectivity bias for coho or sockeye salmon. The results from these and the DIDSON studies will not be published until after these projects conclude in 2012.

Environmental effects on project operations have been discussed throughout this report. The Yentna River fish wheel CPUE is 2–8 times greater than other UCI sites, especially during the day, which we attribute to the highly turbid nature of the river. Turbidity, caused by a heavy silt load, may be good for fish wheel CPUE but can impair the DIDSON lenses and visual acuity of image files if not cleaned every 2 days. Heavy silt loads also cause attenuation problems and reduce fish detection at longer ranges. High water also impacts operations and has in some years put a temporary end to operations and/or forced us to end operations before cessation criteria could be met. Fortunately, this did not occur in 2010.

The CIAA operated weirs on Chelatna, Judd, and Shell lakes in 2010 providing escapement counts for 3 of the major sockeye salmon spawning areas within the Yentna River drainage. The combined weir count from Chelatna, Judd, and Shell lakes was >58,000 sockeye salmon, about 3,000 fish less than the low estimate of the final escapement range. Although we can't conclude anything from this data yet, we think that fish wheel selectivity may have, in part, caused us to underestimate sockeye salmon escapement in the past.

## **CRESCENT RIVER**

In 2010, the sockeye salmon escapement estimate for the Crescent River was the 5th highest documented, exceeding the upper end of the BEG for the seventh time since 2000 (the project was not conducted in 2009). The low total counts of chum and Chinook salmon and the absence of coho salmon are not a good indication of run strength, because we think run timing for these species differs substantially from sockeye salmon. The Crescent River is the only river in UCI where we apportion Dolly Varden char from the daily counts. In 1993, the first year we used a fish wheel for apportionment, Dolly Varden appeared in the catch in large numbers and were big enough (350–500 mm) to meet target detection thresholds (Davis and King 1994). We assumed that these fish were migratory based on morphological characteristics and results of marking studies from 1993–1995 (Davis and King 1996) when we failed to recover a single tagged fish. It's possible that we may have over-apportioned sonar counts to sockeye salmon prior to this discovery in 1993. How much we over-apportioned is unknown but for most years since 1993 the difference was not substantial (<5%).

The fish wheel was located along the south bank next to shore because of water depth, velocity, and nearshore fish distribution. The south side may be more impractical as a fish wheel site, because the water is shallower, slower, and fish are more dispersed. The CPUE was better than average in 2010 and satisfied our minimum sample size requirements for ASL analysis. Like other rivers, high turbidity improves fish wheel CPUE but is usually associated with rising or

high water, which can be a problem for sonar operations. During the middle 2 weeks of July the river was at its highest level of the season but was not a threat to operations.

## ACKNOWLEDGMENTS

We acknowledge the work of the permanent seasonal staff responsible for operating and collecting the data: Kenai River sonar –Jim Lazar (Crew Leader), Jennifer Brannen Nelson, Mike Skinner, and Remy Spring; Kasilof River Sonar – Larry Wheat (Crew Leader), Phil Morin, and Richard Dederick; Yentna River Sonar – Theodore D. Hacklin (Crew Leader), Stan Walker, Kris Dent, and Rachael Maryott; and Crescent River Sonar – Anne Beesely and Trevor Ose.

We also acknowledge the Alaska Department of Fish and Game (ADF&G) Division of Sport Fish, Soldotna, for data collected at Russian River weir (Kenai River drainage) and Fish Creek weir counts. Cook Inlet Aquaculture Association provided escapement data (weir counts) from Hidden Lake (Kenai River drainage), Larson, Judd, Chelatna, Shell, and Whiskey Lakes (Susitna drainage).

## REFERENCES CITED

- ADF&G (Alaska Department Fish and Game). 1983. Susitna hydro aquatic studies Phase II report. Synopsis of the 1982 Aquatic Studies and analysis of Fish and Habitat Relationships. Appendix A, Alaska Department of Fish and Game, Susitna Hydro Aquatic Studies, Anchorage.
- Belcher, E. O., B. Matsuyama and G. M. Trimble. 2001. Object identification with acoustic lenses. Pages 6–11 [In] Conference proceedings MTS/IEEE Oceans, volume 1, session 1, November 5–8, Honolulu Hawaii.
- Belcher, E. O., W. Hanot and J. Burch. 2002. Dual-frequency identification sonar. Pages 187–192 [In] Proceedings of the 2002 International Symposium on Underwater Technology, April 16–19. Tokyo, Japan.
- Bendix Corporation. 1980. Installation and operation manual for side scan salmon counter (1980 model). Bendix Corporation Oceanics Division Report SP-78-017, Sylmar, California.
- Bendix Corporation. 1984. Installation and operation manual long range side scan herring counter with rock inhibitor. Bendix Corporation Oceanics Division, Sylmar, California.
- Davis, A. S. 1971. Sockeye salmon investigations. Completion Report. Project No. 5-6-R and 5-18-R, Commercial Fisheries Research and Development Act, PL 88-304 and PL 88-309 (as amended).
- Davis, R. Z., and B. E. King. 1994. Upper Cook Inlet salmon escapement studies, 1993. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A94-27, Anchorage.
- Davis, R. Z., and B. E. King. 1996. Upper Cook Inlet salmon escapement studies, 1995. Alaska Department of Fish and game, Commercial Fisheries Management and Development division, Regional Information Report 2A96-13, Anchorage.
- Davis, R.Z. 1997. Upper Cook Inlet salmon escapement studies, 1997. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A98-31, Anchorage.
- DeCino, R. D. and J. A. Edmundson. 2003. Estimates of juvenile sockeye salmon abundance in Skilak and Kenai Lakes, Alaska, by use of split-beam hydroacoustic techniques, September 2002. Alaska Department of Fish and Game, Regional Information Report. 2A03-03, Anchorage.
- Fair, L.F., R. A. Clark, and J. J. Hasbrouck. 2007. Review of salmon escapement goals in Upper Cook Inlet, Alaska, 2007. Alaska Department of Fish and Game, Fishery Manuscript Series No. 07-06, Anchorage.
- Fair, L. F., T. M. Willette, and J. Erickson. 2009. Escapement goal review for Susitna River sockeye salmon, 2009. Alaska Department of Fish and Game, Fishery Manuscript Series No. 09-01, Anchorage.

## REFERENCES CITED (Continued)

- Gaudet, D. M. 1983. 1981 Bendix counter manual. Alaska Department of Fish and Game, Division of Commercial Fisheries (unpublished manuscript), Juneau.
- King, B. E, R. Z. Davis, and K. E. Tarbox. 1989. Upper Cook Inlet salmon escapement studies, 1988. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fisheries Report 89-19, Juneau.
- King, B. E. and K. E. Tarbox. 1984. Upper Cook Inlet salmon escapement studies, 1983. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 122, Juneau
- King, B. E., and K. E. Tarbox. 1987. Upper Cook Inlet salmon escapement studies, 1984. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 201, Juneau.
- King, B. E., and K. E. Tarbox. 1989. Upper Cook Inlet salmon escapement studies, 1987. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 89-11, Juneau.
- Maxwell, S. L., and A. V. Smith. 2007. Generating river bottom profiles with a dual-frequency identification sonar (DIDSON). *North American Journal of Fisheries Management* 27:1294–1309.
- Maxwell, S. L., A. Faulkner, L. F. Fair, and X. Zhang. 2011. A comparison of estimates from 2 hydroacoustic systems used to assess sockeye salmon escapement in 5 Alaska Rivers. Alaska Department of Fish and Game, Division of Commercial Fisheries. Fishery Manuscript Series No. 11-02. Juneau.
- Maxwell, S. L., and N. E. Gove. 2007. Assessing a dual-frequency identification sonar's fish-counting accuracy, precision and turbid river range capability. *Journal of Acoustical Society of America*, 2007, 122:3364–3377.
- Meehan, W. R. 1961. Use of a fish wheel in salmon research and management. *Transactions of American Fisheries Society* 90(4): 490–494.
- Namvedt, T. B, N. V. Friese, D. L. Waltemeyer, M. L. Bethe, and D. C. Whitmore. 1977. Investigations of Cook Inlet sockeye salmon. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Report for the period July 1, 1975 to June 30, 1976, Juneau.
- Tarbox, K. E., and B. E. King. 1991. Target strength measurements of adult salmon in the Yentna River, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries. Regional Information Report 2S91-3. Anchorage
- Tarbox, K. E., B. E. King, and D. L. Waltemyer. 1981. Kenai, Kasilof, and Crescent River sonar investigations. Alaska Department of Fish and Game, Division of Commercial Fisheries, Legislative Report, Juneau.
- Tarbox, K. E., B. E. King, and D. L. Waltemyer. 1983. Cook Inlet sockeye salmon studies. Alaska Department of Fish and Game, Division of Commercial Fisheries, Completion report for period July 1, 1977 to June 30, 1982, Anchorage.
- Westerman, D. L and T. M. Willette. 2007a. Upper Cook Inlet salmon escapement studies, 2005. Alaska Department of Fish and Game, Fisheries Data Series No 07-43, Soldotna.
- Westerman, D. L and T. M. Willette. 2007b. Upper Cook Inlet Salmon escapement studies, 2006. Alaska Department of Fish and Game, Fisheries Data Series No 07-82, Soldotna.
- Westerman, D. L and T. M. Willette. 2010. Upper Cook Inlet Salmon escapement studies, 2007. Alaska Department of Fish and Game, Fisheries Data Series No 10-14, Soldotna.

## **TABLES AND FIGURES**

Table 1.—DIDSON to Bendix conversion factors by bank for the Kenai and Kasilof rivers

River	Bank	Slope ( <i>s</i> )	Intercept ( <i>i</i> )
Kenai	North	1.35	-9.43
	South	1.14	-3.38
Kasilof	North	1.07	-0.56
	South	0.87	6.22

*Note:* Based on a geometric mean regression model in which square root values of the Bendix and DIDSON estimates were used.

Table 2.—Fish wheel selectivity coefficients for sockeye, pink, chum, and coho salmon estimated on the Susitna River

Species	Fish Wheel Selectivity Coefficients					
	1	2	3	4	5	6
Sockeye	0.072	0.134	0.127	0.087	0.033	0.009
Pink	0.119	0.186	0.174	0.164	0.079	0.083
Chum	0.060	0.052	0.083	0.046	0.022	0.018
Coho	0.147	0.110	0.114	0.065	0.007	0.007
Study area:	Talkeetna (Susitna R)- 1981	Talkeetna (Susitna R)- 1982	Curry Sta (Susitna R)- 1981	Curry Sta (Susitna R)- 1982	Taku R-1958	Taku R-1959

*Sources:* ADF&G 1983 in 1981–1982 (coefficients 1–4) and Taku River; Meehan 1961 in 1958–1959 (coefficients 5–6). Fish wheel selectivity coefficients are based on tag recapture probabilities, i.e. proportions of the number of recovered tags to the total number of tagged fish released.

Table 3.—Sockeye salmon passage estimates in the Kenai, Kasilof, Crescent, Yentna, and Susitna rivers 1978–2010.

Year	System					
	Kenai R. <sup>a,b</sup>	Kasilof R. <sup>c</sup>	Crescent R.	Yentna R. <sup>d</sup>	Susitna R	Susitna/Yentna R.
1978	398,900	116,600	ND	ND	94,400	ND
1979	285,020	152,179	86,654	ND	156,890	ND
1980	464,038	184,260 <sup>e</sup>	90,863	ND	190,866	ND
1981	407,639	256,625	41,213	139,401	340,232	ND
1982	619,831	180,239	58,957	113,847	189,772 <sup>f</sup>	215,856 <sup>g</sup> – 265,332 <sup>h</sup>
1983	630,340	210,271	92,122	104,414	112,314	176,114 <sup>h</sup>
1984	344,571	231,685	118,345	149,375	ND	194,480 <sup>i</sup> – 279,446 <sup>h</sup>
1985	502,820	505,049	128,628	107,124	ND	227,924 <sup>h</sup>
1986	501,157	275,963	20,385 <sup>j</sup>	92,076	ND	ND
1987	1,596,871	249,250	120,219	66,054	ND	ND
1988	1,021,469	204,000 <sup>k</sup>	57,716	52,330	ND	ND
1989	1,599,959	158,206	71,064	96,269	ND	ND
1990	659,520	144,136	52,238	140,290	ND	ND
1991	647,597	238,269	44,578	109,632	ND	ND
1992	994,798	184,178	58,229	66,074	ND	ND
1993	813,617	149,939	37,556	141,694	ND	ND
1994	1,003,446	205,117	30,355	128,032	ND	ND
1995	630,447	204,935	52,311	121,220	ND	ND
1996	797,847	249,944	28,729	90,660	ND	ND
1997	1,064,818	266,025	70,768	157,822	ND	ND
1998	767,558	273,213	62,257	119,623	ND	ND
1999	803,379	312,587	66,519	99,029	ND	ND
2000	624,578	256,053	56,599	133,094	ND	ND
2001	650,036	307,570	78,082	83,532	ND	ND
2002	957,924	226,682	62,833	78,591	ND	ND
2003	1,181,309	359,633	122,457	180,813	ND	ND
2004	1,385,981	577,581	103,201	71,281	ND	ND
2005	1,376,452	348,012	125,623	36,921	ND	ND
2006	1,499,692	368,092	92,533	92,896	ND	ND
2007	867,572	336,866	79,406	79,901	ND	ND
2008	614,946	301,469	62,030	90,146	ND	ND
2009	745,170	297,125	ND <sup>l</sup>	43,972–153,910	ND	ND
2010	970,662	267,013 <sup>m</sup>	86,333	59,399–144,949	ND	ND

<sup>a</sup> Counting began 22 June, 1978–1987, and 1 July (1988–2002).

<sup>b</sup> DIDSON generated numbers converted to Bendix equivalents (2007–2010).

<sup>c</sup> Includes counts or estimates prior to 15 June (1978–1988) and post enumeration estimates (1981–1986).

<sup>d</sup> The escapement range for 2009 and 2010 is based on DIDSON estimates and 1 of 7 possible fish wheel catch coefficients.

<sup>e</sup> Escapement estimate revised November 2009. (original estimate was 187,154 fish)

<sup>f</sup> Combined sonar counts from Yentna and Sunshine stations.

<sup>g</sup> Mark–recapture estimates from Sunshine Station added to sonar counts from west bank, Susitna River.

<sup>h</sup> Counts from Yentna Station and mark–recapture estimate from Sunshine Station.

<sup>i</sup> Combined counts from Yentna Station and east bank, Susitna Station.

<sup>j</sup> Counts through 16 July only.

<sup>k</sup> Combined counts from weirs on Bear and Glacier Flat Creeks and surveys of remaining spawning streams (sonar count was 151,856).

<sup>l</sup> Did not conduct escapement project in 2009 because of volcanic activity.

<sup>m</sup> DIDSON generated numbers converted to Bendix equivalents (2010).

Table 4.–Salmon run estimates into the Kenai River, 1 July–19 August, 2010.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	4,290	4,290	0	0	0	0	0	0
2 Jul	4,557	8,847	0	0	0	0	0	0
3 Jul	3,241	12,088	0	0	0	0	0	0
4 Jul	6,092	18,180	0	0	0	0	0	0
5 Jul	10,209	28,389	0	0	0	0	0	0
6 Jul	11,232	39,621	0	0	0	0	0	0
7 Jul	5,013	44,634	0	0	0	0	0	0
8 Jul	8,097	52,731	0	0	0	0	0	0
9 Jul	5,978	58,709	0	0	0	0	0	0
10 Jul	5,544	64,253	0	0	0	0	0	0
11 Jul	8,548	72,801	0	0	0	0	0	0
12 Jul	14,434	87,235	0	0	0	0	0	0
13 Jul	24,412	111,647	0	0	0	0	0	0
14 Jul	16,904	128,551	0	0	0	0	0	0
15 Jul	22,652	151,203	0	0	0	0	0	0
16 Jul	47,016	198,219	0	0	0	0	0	0
17 Jul	62,316	260,535	0	0	0	0	0	0
18 Jul	68,553	329,088	0	0	0	0	0	0
19 Jul	82,804	411,892	0	0	0	0	0	0
20 Jul	55,883	467,775	0	0	0	0	0	0
21 Jul	48,840	516,615	0	0	0	0	0	0
22 Jul	38,757	555,372	0	0	0	0	0	0
23 Jul	35,123	590,495	0	0	0	0	0	0
24 Jul	16,973	607,468	0	0	0	0	0	0
25 Jul	41,089	648,557	0	0	0	0	0	0
26 Jul	19,031	667,588	0	0	0	0	0	0
27 Jul	16,316	683,904	0	0	0	0	0	0
28 Jul	19,323	703,227	0	0	0	0	0	0
29 Jul	14,228	717,455	0	0	0	0	0	0
30 Jul	13,699	731,154	0	0	0	0	0	0
31 Jul	11,525	742,679	0	0	0	0	0	0
1 Aug	14,314	756,993	0	0	0	0	0	0
2 Aug	22,139	779,132	0	0	0	0	0	0
3 Aug	36,317	815,449	0	0	0	0	0	0
4 Aug	14,140	829,589	0	0	0	0	0	0
5 Aug	10,749	840,338	0	0	0	0	0	0
6 Aug	11,560	851,898	0	0	0	0	0	0
7 Aug	12,468	864,366	831	831	0	0	0	0
8 Aug	12,310	876,676	0	831	0	0	513	513
9 Aug	12,060	888,736	389	1,220	195	195	389	902
10 Aug	10,571	899,307	579	1,799	145	340	0	902
11 Aug	6,640	905,948	1,230	3,029	246	586	123	1,025
12 Aug	6,151	912,098	1,107	4,136	0	586	369	1,394
13 Aug	8,860	920,959	451	4,587	75	661	0	1,394
14 Aug	9,588	930,547	1,684	6,271	0	661	777	2,171
15 Aug	13,283	943,830	1,265	7,536	316	977	0	2,171
16 Aug	12,816	956,646	1,915	9,451	295	1,272	147	2,318
17 Aug	5,841	962,487	3,373	12,824	2,057	3,329	165	2,483
18 Aug	4,951	967,438	2,829	15,653	1,650	4,980	707	3,190
19 Aug	3,223	970,662	3,223	18,876	2,955	7,935	537	3,727
Percentage:		96.9		1.9		0.8		0.4
Total Estimate:		1,001,200						

Note: Estimates for species other than sockeye salmon are not indicative of run strength. Estimates are Bendix equivalents except 17.6% of the run are DIDSON estimates between 1 July and 26 July.

Table 5.—Cumulative proportion by date of sockeye salmon passage recorded in the Kenai River, 1994–2010.

Date	Cumulative Proportion																
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
01 Jul		0.000	0.001	0.003	0.002	0.001	0.003	0.002	0.005	0.005	0.002	0.004	0.001	0.004	0.004	0.004	0.004
02 Jul	0.000	0.001	0.002	0.008	0.007	0.003	0.005	0.010	0.013	0.007	0.005	0.010	0.003	0.009	0.009	0.008	0.009
03 Jul	0.001	0.001	0.003	0.014	0.010	0.004	0.011	0.017	0.018	0.011	0.007	0.015	0.005	0.014	0.013	0.013	0.012
04 Jul	0.001	0.002	0.005	0.021	0.013	0.005	0.016	0.023	0.027	0.017	0.009	0.023	0.006	0.017	0.015	0.020	0.019
05 Jul	0.002	0.003	0.007	0.029	0.017	0.006	0.019	0.028	0.056	0.021	0.010	0.033	0.008	0.020	0.017	0.026	0.029
06 Jul	0.003	0.007	0.010	0.034	0.025	0.008	0.023	0.033	0.083	0.024	0.012	0.042	0.010	0.024	0.018	0.032	0.041
07 Jul	0.007	0.011	0.012	0.037	0.033	0.012	0.029	0.038	0.139	0.027	0.015	0.049	0.013	0.030	0.019	0.040	0.046
08 Jul	0.011	0.013	0.017	0.044	0.041	0.016	0.035	0.046	0.177	0.031	0.019	0.058	0.015	0.039	0.021	0.047	0.054
09 Jul	0.013	0.016	0.019	0.047	0.052	0.022	0.047	0.056	0.201	0.037	0.021	0.078	0.017	0.049	0.025	0.055	0.060
10 Jul	0.016	0.019	0.021	0.068	0.065	0.026	0.060	0.063	0.221	0.045	0.023	0.094	0.020	0.054	0.030	0.062	0.066
11 Jul	0.019	0.021	0.025	0.117	0.071	0.029	0.068	0.070	0.234	0.066	0.024	0.122	0.022	0.059	0.032	0.072	0.075
12 Jul	0.021	0.023	0.029	0.171	0.075	0.032	0.075	0.075	0.241	0.117	0.027	0.157	0.023	0.065	0.035	0.098	0.090
13 Jul	0.023	0.025	0.032	0.233	0.078	0.034	0.115	0.080	0.249	0.151	0.031	0.176	0.025	0.068	0.043	0.114	0.115
14 Jul	0.025	0.032	0.065	0.292	0.083	0.039	0.260	0.096	0.260	0.176	0.113	0.188	0.026	0.073	0.047	0.141	0.132
15 Jul	0.032	0.062	0.213	0.309	0.088	0.049	0.386	0.141	0.285	0.194	0.213	0.198	0.029	0.081	0.089	0.209	0.156
16 Jul	0.062	0.073	0.347	0.346	0.102	0.054	0.459	0.187	0.323	0.270	0.282	0.231	0.038	0.089	0.199	0.285	0.204
17 Jul	0.073	0.122	0.402	0.416	0.150	0.067	0.496	0.251	0.352	0.362	0.317	0.276	0.048	0.095	0.282	0.355	0.268
18 Jul	0.122	0.164	0.435	0.495	0.183	0.097	0.545	0.295	0.398	0.441	0.340	0.313	0.054	0.106	0.313	0.404	0.339
19 Jul	0.164	0.190	0.468	0.501	0.209	0.138	0.584	0.348	0.497	0.501	0.355	0.367	0.058	0.155	0.340	0.439	0.424
20 Jul	0.190	0.232	0.498	0.522	0.231	0.164	0.604	0.389	0.562	0.528	0.362	0.393	0.063	0.173	0.388	0.500	0.482
21 Jul	0.232	0.269	0.531	0.542	0.246	0.200	0.624	0.411	0.596	0.555	0.384	0.409	0.074	0.209	0.440	0.537	0.532
22 Jul	0.269	0.298	0.555	0.552	0.272	0.249	0.643	0.434	0.621	0.612	0.453	0.427	0.095	0.263	0.491	0.549	0.572
23 Jul	0.298	0.343	0.592	0.583	0.333	0.308	0.673	0.466	0.648	0.668	0.474	0.465	0.117	0.308	0.508	0.564	0.608
24 Jul	0.343	0.399	0.640	0.648	0.392	0.360	0.714	0.523	0.676	0.714	0.497	0.506	0.147	0.348	0.527	0.586	0.626
25 Jul	0.399	0.420	0.713	0.659	0.434	0.447	0.752	0.597	0.702	0.740	0.522	0.527	0.180	0.387	0.545	0.597	0.668
26 Jul	0.420	0.428	0.755	0.666	0.460	0.515	0.787	0.676	0.735	0.766	0.552	0.541	0.235	0.441	0.557	0.611	0.688
27 Jul	0.428	0.432	0.774	0.670	0.490	0.589	0.816	0.730	0.747	0.787	0.578	0.549	0.272	0.510	0.584	0.660	0.705
28 Jul	0.432	0.440	0.786	0.674	0.544	0.647	0.842	0.759	0.758	0.820	0.608	0.556	0.311	0.559	0.615	0.714	0.724
29 Jul	0.440	0.450	0.794	0.681	0.602	0.685	0.868	0.782	0.771	0.844	0.633	0.565	0.355	0.595	0.651	0.757	0.739
30 Jul	0.450	0.469	0.801	0.688	0.644	0.713	0.882	0.809	0.783	0.860	0.651	0.588	0.393	0.618	0.693	0.793	0.753
31 Jul	0.469	0.525	0.825	0.694	0.694	0.731	0.893	0.832	0.797	0.875	0.666	0.614	0.426	0.640	0.725	0.830	0.765

-continued-

Table 5.–Page 2 of 2.

Date	Cumulative Proportion																
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
01 Aug	0.525	0.620	0.854	0.698	0.766	0.755	0.905	0.854	0.810	0.891	0.675	0.632	0.465	0.663	0.762	0.854	0.780
02 Aug	0.620	0.673	0.877	0.701	0.855	0.779	0.913	0.877	0.825	0.911	0.688	0.643	0.498	0.679	0.790	0.881	0.803
03 Aug	0.673	0.696	0.898	0.705	0.871	0.796	0.927	0.894	0.841	0.928	0.716	0.659	0.526	0.689	0.812	0.911	0.840
04 Aug	0.696	0.713	0.916	0.708	0.882	0.814	0.943	0.914	0.858	0.941	0.748	0.671	0.556	0.704	0.835	0.930	0.855
05 Aug	0.713	0.728	0.928	0.712	0.894	0.829	0.955	0.928	0.876	0.950	0.769	0.683	0.586	0.725	0.854	0.946	0.866
06 Aug	0.728	0.740	0.938	0.724	0.914	0.845	0.967	0.942	0.891	0.965	0.789	0.710	0.606	0.752	0.871	0.955	0.878
07 Aug	0.740	0.748	0.953	0.737	0.929	0.869	0.976	0.957	0.907	0.976	0.804	0.734	0.621	0.770	0.885	0.962	0.890
08 Aug	0.748	0.757	0.967	0.758	0.943	0.893	0.984	0.971	0.927	0.984	0.813	0.745	0.630	0.785	0.896	0.966	0.903
09 Aug	0.757	0.771	0.982	0.774	0.953	0.912	0.991	0.978	0.952	0.992	0.835	0.753	0.639	0.814	0.908	0.972	0.916
10 Aug	0.771	0.791	0.991	0.784	0.962	0.921	1.000	0.986	0.971	1.000	0.868	0.760	0.647	0.830	0.926	0.982	0.926
11 Aug	0.791	0.814	1.000	0.805	0.974	0.930		0.989	0.984		0.900	0.771	0.657	0.855	0.944	0.987	0.933
12 Aug	0.814	0.835		0.821	0.986	0.944		0.998	0.990		0.934	0.809	0.673	0.881	0.961	0.992	0.940
13 Aug	0.835	0.857		0.841	1.000	0.951		1.000	0.996		0.955	0.854	0.687	0.897	0.973	1.000	0.949
14 Aug	0.857	0.874		0.856		0.962			1.000		0.969	0.881	0.700	0.910	0.986		0.959
15 Aug	0.874	0.896		0.868		0.976					0.981	0.912	0.721	0.922	0.995		0.972
16 Aug	0.896	0.914		0.877		0.984					0.988	0.941	0.745	0.934	0.998		0.986
17 Aug	0.914	0.926		0.893		0.992					0.995	0.961	0.767	0.944	1.000		0.992
18 Aug	0.926	0.942		0.906		1.000					1.000	0.973	0.788	0.954			0.997
19 Aug	0.942	0.963		0.919								0.980	0.814	0.966			1.000
21 Aug	0.963	0.977		0.932								0.991	0.839	0.978			
21 Aug	0.977	0.985		0.944								1.000	0.855	0.985			
22 Aug	0.985	0.992		0.956									0.878	0.992			
23 Aug	0.992	1.000		0.970									0.898	1.000			
24 Aug	1.000			0.985									0.912				
25 Aug				1.000									0.927				
26 Aug													0.942				
31 Aug													1.000				
Midpoint	01 Aug	31 Jul	21 Jul	19 Jul	28 Jul	26 Jul	18 Jul	24 Jul	20 Jul	19 Jul	25 Jul	24 Jul	3 Aug	27 Jul	23 Jul	20 Jul	21 Jul
Ave. (1979-2009):	23 Jul	(1994-2009):	24 Jul														
No. days																	
for 80%	31	31	21	39	22	22	20	21	32	22	29	36	33	28	25	22	27
80% Ave, 1979–2009 :	22 d	1994–2009:	27 d														

Note: Data available from 1979 to present.

Table 6.—Distribution of sockeye salmon passage by bank (% of total count) in the Kenai, Kasilof, Crescent, and Yentna rivers, 1979–2010.

Year	River							
	Kenai		Kasilof		Crescent		Yentna	
	North	South	North	South	North	South	North	South
1979	72	28	53	47	ND	ND	ND	ND
1980	61	39	52	48	49	51	ND	ND
1981	72	28	69	31	57	43	ND	ND
1982	39	61	73	27	54	46	ND	ND
1983	42	58	51	49	39	61	ND	ND
1984	65	35	56	44	71	28	ND	ND
1985	54	46	70	30	70	30	9	91
1986	62	38	57	43	84	16	32	68
1987	48	52	55	45	64	36	10	90
1988	47	53	32	68	53	47	8	92
1989	57	43	39	61	52	48	12	88
1990	62	38	29	71	44	56	2	98
1991	73	27	39	61	33	67	8	92
1992	60	40	45	55	56	44	5	95
1993	49	51	28	72	41	56	14	86
1994	52	48	47	53	65	35	8	92
1995	52	48	38	62	68	32	11	89
1996	54	46	61	39	68	32	21	79
1997	56	44	41	59	79	21	11	89
1998	55	45	36	64	70	30	49	51
1999	55	45	51	49	53	47	26	74
2000	64	36	51	49	63	37	22	78
2001	50	50	63	37	79	21	38	63
2002	49	51	48	52	74	26	25	75
2003	49	51	50	50	65	35	29	71
2004	49	51	43	57	64	36	6	94
2005	45	55	59	41	65	35	17	83
2006	41	59	67	33	54	46	11	89
2007	50	50	75	25	63	37	16	84
2008	48	52	73	27	60	40	15	85
2009	47	53	74	26	ND	ND	16–19	81–83
2010	51	49	70	30	52	48	17–20	80–82
Ave. (1979–2009)	51	49	55	45	66	34	21	79

Table 7.–Inshore and offshore distribution of fish along both banks of the Kenai and Yentna rivers (top) based on the DIDSON subsample counts, and distribution by sector (Bendix counts) for both banks of the Crescent River (bottom), 2010.

	DIDSON Range					
	Kenai River		Kasilof River		Yentna River	
	1–10 m	10–30 m	1–10 m	10–30 m	1–10 m	10–30 m
	North Bank					
Subsample Totals	108,180	15,543	33,956	1,497	14,995	1,021
15 Jun–20 Jun	ND	ND	70.0%	30.0%	ND	ND
21 Jun–27 Jun	ND	ND	86.3%	13.7%	ND	ND
28 Jun–4 Jul	19.7%	80.3%	89.2%	10.8%	ND	ND
5 Jul–11 Jul	36.2%	63.8%	91.1%	8.9%	83.4%	16.6%
12 Jul–18 Jul	93.4%	6.6%	98.1%	1.9%	90.9%	9.1%
19 Jul–25 Jul	94.8%	5.2%	98.8%	1.2%	96.3%	3.7%
26 Jul–1 Aug	84.1%	15.9%	99.6%	0.4%	94.0%	6.0%
2 Aug–8 Aug	93.8%	6.2%	99.9%	0.1%	92.1%	7.9%
9 Aug–15 Aug	92.8%	7.2%	100.0%	0.0%	94.0%	6.0%
16 Aug–	92.6%	7.4%	ND	ND	ND	ND
Subsample Totals	87.4%	12.6%	95.8%	4.2%	93.6%	6.4%
SD	0.0%	0.0%	4.9%	4.9%	6.2%	6.2%
var	0.0%	0.0%	0.2%	0.2%	0.4%	0.4%
min	11.3%	1.4%	50.8%	0.0%	75.0%	-8.3%
max	98.6%	88.7%	100.0%	49.2%	108.3%	25.0%
	South Bank					
Subsample Totals	96,570	1,756	11,876	2,518	42,314	2,413
15 Jun–20 Jun	ND	ND	51.8%	48.2%	ND	ND
21 Jun–27 Jun	ND	ND	73.3%	26.7%	ND	ND
28 Jun–4 Jul	85.9%	14.1%	75.8%	24.2%	ND	ND
5 Jul–11 Jul	89.7%	10.3%	83.2%	16.8%	79.2%	20.8%
12 Jul–18 Jul	98.5%	1.5%	85.0%	15.0%	93.6%	6.4%
19 Jul–25 Jul	99.3%	0.7%	95.1%	4.9%	96.8%	3.2%
26 Jul–1 Aug	98.3%	1.7%	95.2%	4.8%	92.2%	7.8%
2 Aug–8 Aug	98.7%	1.3%	96.8%	3.2%	94.3%	5.7%
9 Aug–15 Aug	98.1%	1.9%	98.4%	1.6%	95.5%	4.5%
16 Aug–	97.0%	3.0%	ND	ND	ND	ND
Subsample Totals	98.2%	1.8%	82.5%	17.5%	94.6%	5.4%
SD	0.0%	0.0%	9.3%	9.3%	6.3%	6.3%
var	0.0%	0.0%	0.9%	0.9%	0.4%	0.4%
min	80.2%	0.3%	41.3%	0.0%	70.7%	0.5%
max	99.7%	19.8%	100.0%	58.7%	99.5%	29.3%

-continued-

Table 7.–Page 2 of 2.

Crescent River	Bendix Range											
	Sector											
	1	2	3	4	5	6	7	8	9	10	11	12
North Bank												
Daily %	32.6	34.8	21.2	8.0	2.4	0.5	0.2	0.1	0.0	0.0	0.0	0.2
Cum. %	32.6	67.4	88.6	96.6	99.0	99.5	99.7	99.8	99.8	99.8	99.8	100.0
Average (m):	0.8	1.5	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.7	8.4	9.2
Min. & max. ranges:	7.6		11.6		Dead range		0.3–0.8 m		SD	1.0		
South Bank												
Daily %	17.5	50.3	27.8	4.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cum. %	17.5	67.8	95.6	99.6	99.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average (m):	0.4	0.8	1.2	1.5	1.9	2.3	2.7	3.1	3.5	3.8	4.2	4.6
Min. & max. ranges:	4.0		4.9		Dead range		0.3–0.8 m		SD	0.1		

*Note:* To determine total range from transducer, add dead range to counting range.

Table 8.—Daily fish wheel catch by species for the Kenai River, 1 July–19 August, 2010.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	21.0	10	10	0	0	0	0	0	0	0	0
2 Jul	24.8	12	22	0	0	0	0	0	0	0	0
3 Jul	22.2	2	24	0	0	0	0	0	0	0	0
4 Jul	21.9	21	45	0	0	0	0	0	0	0	0
5 Jul	24.3	12	57	0	0	0	0	0	0	0	0
6 Jul	10.0	19	76	0	0	0	0	0	0	0	0
7 Jul	21.5	6	82	0	0	0	0	0	0	0	0
8 Jul	14.6	6	88	0	0	0	0	0	0	2	2
9 Jul	14.3	43	131	0	0	0	0	0	0	1	3
10 Jul	9.0	19	150	0	0	0	0	0	0	0	3
11 Jul	7.0	27	177	0	0	0	0	0	0	2	5
12 Jul	14.0	15	192	0	0	0	0	0	0	0	5
13 Jul	11.0	29	221	0	0	0	0	0	0	0	5
14 Jul	5.0	54	275	0	0	0	0	0	0	0	5
15 Jul	7.3	15	290	0	0	0	0	0	0	0	5
16 Jul	12.3	42	332	1	1	0	0	0	0	1	6
17 Jul	11.0	57	389	0	1	0	0	0	0	0	6
18 Jul	3.0	50	439	0	1	0	0	0	0	0	6
19 Jul	6.0	108	547	0	1	0	0	0	0	0	6
20 Jul	4.3	85	632	0	1	0	0	0	0	0	6
21 Jul	4.0	138	770	0	1	0	0	0	0	0	6
22 Jul	8.5	40	810	0	1	0	0	0	0	0	6
23 Jul	7.5	26	836	0	1	0	0	0	0	0	6
24 Jul	12.5	34	870	0	1	0	0	0	0	0	6
25 Jul	21.0	96	966	1	2	0	0	0	0	0	6
26 Jul	7.0	75	1,041	0	2	0	0	1	1	0	6
27 Jul	9.2	25	1,066	0	2	0	0	0	1	0	6
28 Jul	10.8	24	1,090	0	2	0	0	1	2	1	7
29 Jul	17.0	12	1,102	0	2	0	0	0	2	0	7
30 Jul	17.3	25	1,127	0	2	0	0	0	2	0	7
31 Jul	14.0	8	1,135	0	2	0	0	0	2	0	7
1 Aug	12.5	31	1,166	0	2	0	0	0	2	0	7
2 Aug	12.8	12	1,178	1	3	0	0	1	3	1	8
3 Aug	9.8	58	1,236	0	3	0	0	2	5	0	8
4 Aug	11.0	30	1,266	0	3	0	0	0	5	0	8
5 Aug	0.0	0	1,266	0	3	0	0	0	5	0	8
6 Aug	35.8	18	1,284	0	3	0	0	1	6	0	8
7 Aug	17.5	30	1,314	2	5	0	0	0	6	0	8
8 Aug	12.5	24	1,338	0	5	0	0	0	6	1	9
9 Aug	24.0	62	1,400	2	7	0	0	1	7	2	11
10 Aug	8.8	73	1,473	4	11	0	0	1	8	0	11
11 Aug	35.7	54	1,527	10	21	0	0	2	10	1	12
12 Aug	22.8	50	1,577	9	30	0	0	0	10	3	15
13 Aug	20.5	118	1,695	6	36	0	0	1	11	0	15
14 Aug	18.0	74	1,769	13	49	0	0	0	11	6	21
15 Aug	28.5	42	1,811	4	53	0	0	1	12	0	21
16 Aug	22.2	87	1,898	13	66	0	0	2	14	1	22
17 Aug	23.9	71	1,969	41	107	0	0	25	39	2	24
18 Aug	14.5	21	1,990	12	119	0	0	7	46	3	27
19 Aug	17.1	12	2,002	12	131	0	0	11	57	2	29
% of Total		90.2		5.9		0.0		2.6		1.3	
Total: 2,219 salmon		Hrs Operated: 741.1				CPUE: 3.0 fish/hr					

Note: Other fish includes 2 rainbow trout and 19 Dolly Varden.

Table 9.—Summary of fish wheel catch and CPUE for the north bank fish wheel at RM 19, Kenai River, 1978–2010.

Year	Total Hours	Actual North Bank fish wheel catch (salmon only)								Total Catch	CPUE by species				Total CPUE
		Sockeye	%	Pink	%	Coho	%	Chinook	%		Sockeye	Pink	Coho	Chinook	
1978	853.9	1,445	87.3	207	12.5	4	0.2	0	0.0	1,656	1.7	0.2	0.0	0.0	1.9
1979	301.0	151	84.8	10	5.6	13	7.3	4	2.2	178	0.5	0.0	0.0	0.0	0.6
1980	967.3	464	29.4	1,103	69.8	12	0.8	1	0.1	1,580	0.5	1.1	0.0	0.0	1.6
1981	1,210.8	496	95.0	21	4.0	3	0.6	2	0.4	522	0.4	0.0	0.0	0.0	0.4
1982	433.5	1,200	99.5	2	0.2	2	0.2	2	0.2	1,206	2.8	0.0	0.0	0.0	2.8
1983	448.0	1,678	99.8	0	0.0	3	0.2	0	0.0	1,681	3.7	0.0	0.0	0.0	3.8
1984	962.4	5,854	98.3	64	1.1	36	0.6	3	0.1	5,957	6.1	0.1	0.0	0.0	6.2
1985	394.8	3,294	98.2	37	1.1	17	0.5	7	0.2	3,355	8.3	0.1	0.0	0.0	8.5
1986	408.5	797	97.8	6	0.7	9	1.1	3	0.4	815	2.0	0.0	0.0	0.0	2.0
1987	493.1	4,795	98.1	18	0.4	59	1.2	17	0.3	4,889	9.7	0.0	0.1	0.0	9.9
1988	528.4	4,393	97.5	73	1.6	18	0.4	21	0.5	4,505	8.3	0.1	0.0	0.0	8.5
1989	357.0	6,341	98.2	69	1.1	28	0.4	16	0.2	6,454	17.8	0.2	0.1	0.0	18.1
1990	363.6	4,270	97.8	46	1.1	24	0.5	26	0.6	4,366	11.7	0.1	0.1	0.1	12.0
1991	393.0	6,732	98.6	49	0.7	25	0.4	19	0.3	6,825	17.1	0.1	0.1	0.0	17.4
1992	392.5	5,526	94.0	224	3.8	96	1.6	33	0.6	5,879	14.1	0.6	0.2	0.1	15.0
1993	515.2	4,631	99.2	16	0.3	10	0.2	10	0.2	4,667	9.0	0.0	0.0	0.0	9.1
1994	673.9	5,600	93.6	290	4.8	65	1.1	29	0.5	5,984	8.3	0.4	0.1	0.0	8.9
1995	799.4	3,022	98.5	14	0.5	10	0.3	22	0.7	3,068	3.8	0.0	0.0	0.0	3.8
1996	376.5	3,835	91.2	264	6.3	82	2.0	22	0.5	4,203	10.2	0.7	0.2	0.1	11.2
1997	553.8	8,886	96.6	21	0.2	266	2.9	30	0.3	9,203	16.0	0.0	0.5	0.1	16.6
1998	350.5	7,755	96.2	173	2.1	99	1.2	34	0.4	8,061	22.1	0.5	0.3	0.1	23.0
1999	400.8	4,600	95.9	108	2.3	56	1.2	33	0.7	4,797	11.5	0.3	0.1	0.1	12.0
2000	499.0	3,020	88.5	205	6.0	146	4.3	40	1.2	3,411	6.1	0.4	0.3	0.1	6.8
2001	446.7	3,309	96.8	36	1.1	30	0.9	45	1.3	3,420	7.4	0.1	0.1	0.1	7.7
2002	610.5	4,073	88.4	461	10.0	54	1.2	18	0.4	4,606	6.7	0.8	0.1	0.0	7.5
2003	317.1	2,749	98.0	20	0.7	12	0.4	25	0.9	2,806	8.7	0.1	0.0	0.1	8.8
2004	461.7	3,299	75.0	843	19.2	225	5.1	31	0.7	4,398	7.1	1.8	0.5	0.1	9.5
2005	184.9	3,140	97.8	27	0.8	28	0.9	16	0.5	3,211	17.0	0.1	0.2	0.1	17.4
2006	635.0	12,285	86.0	1,413	9.9	485	3.4	101	0.7	14,284	19.3	2.2	0.8	0.2	22.5
2007	933.5	6,243	98.1	16	0.3	76	1.2	27	0.4	6,362	6.7	0.0	0.1	0.0	6.8
2008	862.4	5,250	89.9	489	8.4	80	1.4	18	0.3	5,837	6.1	0.6	0.1	0.0	6.8
2009	427.2	1,435	93.9	76	5.0	10	0.7	7	0.5	1,528	3.4	0.2	0.0	0.0	3.6
2010	741.1	2,002	90.2	131	5.9	57	2.6	29	1.3	2,219	2.7	0.2	0.1	0.0	3.0

-continued-

Table 9.–Page 2 of 2.

Year	Actual North Bank fish wheel catch (salmon only)										Average CPUE by species				
	Ave.	Average Catch								Total	Sockeye	Pink	Coho	Chinook	Total
	Hours	Sockeye	%	Pink	%	Coho	%	Chinook	%						
Odd	511.0	3,844	97.7	34	0.9	40	1.0	18	0.4	3,935	7.5	0.1	0.1	0.0	7.7
Even	586.2	4,317	88.2	366	9.8	90	1.6	24	0.4	4,797	7.4	0.6	0.2	0.0	8.2
Average (%): (1978–2009)			93.5		4.6		1.5		0.5		7.4	0.2	0.4	0.0	0.1
Minimum (%): (1978–2009)			29.4		0.0		0.2		0.0		0.4	0.0	0.0	0.0	0.4
Maximum (%): (1978–2009)			99.8		69.8		7.3		2.2		22.1	2.2	0.8	0.2	23.0
SD (%): (1978–2009)			12.8		12.5		1.6		0.4		5.9	0.5	0.2	0.0	6.1

Note: Beginning and end dates varied from year to year so the average catches are an indication of fish passage for the project period only.

Table 10.—Age composition of Kenai River sockeye salmon sampled from its fish wheel, 1970–2010.

Year	% Age Composition								Sample Size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
1970	0.0	10.0	17.0	0.0	26.0	25.0	15.0	6.0	225
1971	0.0	8.0	39.0	1.0	3.0	38.0	11.0	0.0	168
1972	0.0	21.0	34.0	0.0	0.0	23.0	20.0	0.0	403
1973	0.0	5.0	68.0	1.0	1.0	8.0	16.0	0.0	632
1974	2.0	18.0	46.0	0.0	3.0	18.0	12.0	0.0	295
1975	2.0	10.0	36.0	2.0	4.0	31.0	14.0	1.0	162
1976	1.0	46.0	20.0	0.0	2.0	22.0	8.0	1.0	948
1977	0.0	6.0	76.0	1.0	0.0	7.0	10.0	0.0	1,265
1978	0.0	2.5	86.7	0.0	0.0	4.9	5.4	0.0	811
1979	0.2	19.6	63.0	0.0	0.0	10.6	6.6	0.0	601
1980	6.1	35.4	36.7	0.0	0.9	14.4	6.5	0.0	557
1981	0.0	19.7	66.4	0.0	0.5	7.9	5.3	0.2	624
1982	0.1	5.8	87.5	0.0	0.0	2.9	3.7	0.0	1,787
1983	0.3	8.4	79.0	0.3	0.5	2.2	8.9	0.4	1,765
1984	0.0	23.1	37.8	3.6	0.5	13.2	19.5	2.3	2,067
1985	0.1	15.9	56.4	0.3	0.1	14.7	11.4	1.1	2,201
1986	0.0	31.8	39.5	0.7	0.3	8.2	18.0	1.5	789
1987	0.0	12.8	78.4	0.1	0.0	3.2	5.2	0.3	745
1988	0.3	11.6	74.2	0.4	0.2	3.1	10.2	0.0	1,420
1989	0.2	5.6	26.7	0.9	0.8	7.6	57.4	0.8	1,587
1990	0.6	21.6	41.4	0.6	0.3	13.7	21.1	0.7	1,513
1991	0.1	48.2	31.6	0.2	0.4	5.7	11.4	2.4	2,502
1992	0.0	2.7	79.9	0.2	0.3	5.9	11.0	0.0	1,338
1993	0.3	12.2	30.5	2.6	6.3	6.4	41.2	0.5	2,088
1994	0.3	6.6	61.1	0.8	0.8	17.8	12.1	0.5	1,341
1995	0.3	31.9	26.4	0.4	2.4	6.6	31.3	0.7	712
1996	0.0	10.8	75.4	0.3	0.7	6.1	5.4	1.3	684
1997	0.1	7.6	75.2	0.4	0.4	2.8	13.0	0.5	963
1998	0.3	27.1	40.7	1.3	6.6	9.6	13.9	0.5	700
1999	0.0	15.1	55.4	0.4	1.2	16.8	9.6	1.5	733
2000	0.0	15.3	55.1	1.0	2.6	9.4	14.5	2.1	560
2001	0.3	10.8	68.9	0.8	1.5	8.3	9.2	0.2	601
2002	0.0	23.0	58.4	0.7	0.7	10.6	6.1	0.5	2,441
2003	0.0	14.4	57.9	0.4	0.1	8.0	18.7	0.5	1,555
2004	0.0	10.1	69.1	0.2	0.2	8.2	11.1	1.1	1,275
2005	0.0	2.8	81.3	0.3	0.2	2.8	11.8	0.8	1,893
2006	0.0	9.9	38.7	2.4	0.4	3.7	44.0	0.9	1,315
2007	0.0	5.9	78.8	1.5	0.7	4.4	7.8	0.9	759
2008	0.0	15.2	60.9	4.6	0.7	7.2	10.9	0.5	567
2009	0.3	6.1	72.6	0.9	0.1	9.8	9.7	0.4	701
2010	0.2	23.4	44.4	0.2	2.8	4.7	23.9	0.4	855
Ave. (1970–09)	0.4	15.3	55.7	0.8	1.7	10.7	14.4	0.8	1,092

Table 11.—Average length composition of the major age classes of sockeye salmon sampled from the Kenai River fish wheel, 1980–2010.

Year	Male			Female		Both		Male : Female	Male			Female		Both		Male : Female
	Age Class	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size		Age Class	Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	
1980	1.2	482	168	494	100	486	268	1.7:1	1.3	580	180	561	192	570	372	0.9:1
1981		493	85	513	73	501	158	1.2:1		590	290	569	430	575	720	0.7:1
1982		483	70	505	32	490	102	2.2:1		596	723	572	841	583	1,564	0.9:1
1983		524	25	520	30	522	55	0.8:1		598	215	577	269	586	484	0.8:1
1984		474	280	473	196	474	476	1.4:1		582	385	559	395	571	780	1.0:1
1985		492	184	490	186	491	370	1.0:1		575	496	552	824	560	1,320	0.6:1
1986		488	155	492	96	489	251	1.6:1		584	112	564	200	571	312	0.6:1
1987		513	39	502	56	507	95	0.7:1		604	183	586	401	591	584	0.5:1
1988		521	79	511	84	516	163	0.9:1		598	428	572	624	583	1,052	0.7:1
1989		464	51	463	40	463	91	1.3:1		592	213	565	218	578	431	1.0:1
1990		474	168	478	127	476	295	1.3:1		586	358	559	318	574	676	1.1:1
1991		488	613	497	577	492	1,190	1.1:1		561	357	539	441	549	798	0.8:1
1992		480	13	462	25	468	38	0.5:1		573	370	549	714	557	1,084	0.5:1
1993		474	123	481	132	477	255	0.9:1		583	247	556	390	566	637	0.6:1
1994		452	46	462	42	457	88	1.1:1		579	367	552	452	564	819	0.8:1
1995		492	116	487	111	489	227	1.0:1		584	81	564	107	572	188	0.8:1
1996		507	47	519	27	511	74	1.7:1		607	243	589	273	597	516	0.9:1
1997		480	34	489	39	485	73	0.9:1		593	372	571	352	582	724	1.1:1
1998		483	95	494	95	488	190	1.0:1		577	146	547	139	562	285	1.1:1
1999		490	72	488	39	490	111	1.8:1		600	202	576	204	588	406	1.0:1
2000		513	47	513	43	513	90	1.1:1		605	159	584	165	594	324	1.0:1
2001		522	35	507	30	515	65	1.2:1		596	196	577	218	586	414	0.9:1
2002		503	306	502	256	503	562	1.2:1		606	665	580	760	592	1,425	0.9:1
2003		483	116	466	117	474	233	1.0:1		593	387	574	504	582	891	0.8:1
2004		497	64	482	65	489	129	1.0:1		585	396	569	485	576	881	0.8:1
2005		483	27	495	30	490	57	0.9:1		588	649	564	883	574	1,532	0.7:1
2006		498	72	497	58	497	130	1.2:1		572	239	553	270	562	509	0.9:1
2007		512	21	499	24	505	45	0.9:1		594	313	567	285	581	598	1.1:1
2008		472	45	465	41	468	86	1.1:1		595	160	576	185	585	345	0.9:1
2009		482	24	492	19	486	43	1.3:1		594	206	578	303	584	509	0.7:1
2010		474	121	493	79	481	200	1.5:1		578	163	568	217	573	380	0.8:1
Ave. (1980–2009)		488	110	491	96	489	206	1.2:1		579	315	556	398	566	713	0.8:1

-continued-

Table 11.–Page 2 of 2.

Year	Age Class	Male		Female		Both		Male : Female	Age Class	Male		Female		Both		Male : Female
		Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size			Length (mm)	Sample Size	Length (mm)	Sample Size	Length (mm)	Sample Size	
1980	2.2	525	13	534	35	532	48	0.4:1	2.3	589	67	579	80	585	147	0.8:1
1981		ND	ND	ND	ND	525	ND	ND		ND	ND	ND	ND	588	ND	ND
1982		530	21	522	30	525	51	0.7:1		598	46	580	21	592	67	2.2:1
1983		524	25	520	30	522	55	0.8:1		595	26	582	35	587	61	0.7:1
1984		505	116	508	159	507	275	0.7:1		570	210	557	192	564	402	1.1:1
1985		513	132	513	196	513	328	0.7:1		570	106	555	129	562	235	0.8:1
1986		ND		585	52	568	89	575	141	0.6:1						
1987		510	11	517	13	514	24	0.8:1		608	15	583	24	593	39	0.6:1
1988		527	20	527	24	527	44	0.8:1		596	53	577	92	584	145	0.6:1
1989		499	47	505	73	503	120	0.6:1		605	402	579	501	591	903	0.8:1
1990		494	88	496	113	495	201	0.8:1		589	177	568	132	580	309	1.3:1
1991		497	68	486	89	491	157	0.8:1		572	153	543	139	558	292	1.1:1
1992		485	31	485	44	485	75	0.7:1		570	46	547	88	555	134	0.5:1
1993		514	58	519	76	517	134	0.8:1		583	357	560	503	570	860	0.7:1
1994		481	67	488	171	486	238	0.4:1		578	73	551	89	563	162	0.8:1
1995		504	23	521	24	513	47	1.0:1		588	114	569	109	578	223	1.0:1
1996		511	18	520	24	516	42	0.8:1		606	18	598	19	602	37	0.9:1
1997		489	12	504	15	498	27	0.8:1		600	52	567	73	581	125	0.7:1
1998		501	28	507	39	504	67	0.7:1		574	48	559	49	566	97	1.0:1
1999		517	38	512	85	513	123	0.4:1		592	37	574	33	583	70	1.1:1
2000		519	35	518	20	519	55	1.8:1		603	44	583	41	593	85	1.1:1
2001		519	14	538	36	533	50	0.4:1		600	26	579	29	588	55	0.9:1
2002		515	117	513	142	514	259	0.8:1		604	75	579	74	591	149	1.0:1
2003		514	45	515	73	515	118	0.6:1		594	135	574	163	583	298	0.8:1
2004		513	34	512	71	512	105	0.5:1		596	71	566	71	581	142	1.0:1
2005		499	20	508	39	505	59	0.5:1		582	110	561	111	572	221	1.0:1
2006		521	17	523	31	522	48	0.5:1		577	250	557	329	566	579	0.8:1
2007		517	11	520	22	519	33	0.5:1		587	26	568	33	576	59	0.8:1
2008		489	14	504	27	499	41	0.5:1		589	37	572	25	582	62	1.5:1
2009		506	26	534	43	524	69	0.6:1		591	29	578	39	583	68	0.7:1
2010		488	27	498	13	491	40	2.1:1		591	75	568	129	576	204	0.6:1
Ave. (1980–2009)		495	42	496	63	496	105	0.7:1		581	101	559	117	569	218	0.9:1
2010 (all ages)		536	407	550	448	543	855	0.9:1								

Table 12.—Observer comparisons by individuals (#1–10) and by groups. Individuals 1–5 were comprised of the Kenai crew and individuals 6–10 represent other crews.

	Observer	1–10			1–5				6–10			
	Ave.	Difference	% Dif.	R <sup>2</sup>	Ave.	Difference	% Dif.	R <sup>2</sup>	Ave.	Difference	% Dif.	R <sup>2</sup>
1	465	4	1.0	0.990	465	19	4.2	0.994	-	-	-	-
2	440	-21	-4.6	0.976	440	-7	-1.5	0.992	-	-	-	-
3	432	-29	-6.2	0.944	432	-14	-3.2	0.970	-	-	-	-
4	449	-11	-2.5	0.995	449	3	0.7	0.993	-	-	-	-
5	445	-15	-3.4	0.988	445	-1	-0.2	0.983	-	-	-	-
6	453	-8	-1.7	0.984	-	-	-	-	453	-23	-4.8	0.975
7	437	-24	-5.3	0.989	-	-	-	-	437	-39	-8.3	0.986
8	424	-37	-8.1	0.952	-	-	-	-	424	-52	-11.0	0.967
9	527	66	14.4	0.981	-	-	-	-	527	51	10.8	0.988
10	531	70	15.1	0.945	-	-	-	-	531	55	11.5	0.984
n	470	-	-	-	240	-	-	-	230	-	-	-
Ave.	461	-	-	-	446	-	-	-	476	-	-	-
SD	38	-	8.2	-	12	-	2.8	-	51	-	10.7	-
min	424	-37	-8	0.944	432	-14	-3.17	0.970	424	-52	-11	0.967
max	531	70	15	0.995	465	19	4.22	0.994	531	55	11	0.988

*Note:* The R-square value correlates the individual observer with the group average, provided at the bottom. The difference was calculated from the average of all observers (461;  $n=470$ ) and the observer average ( $n=47+$ ).

Table 13.—Average DIDSON subsample counts by observer stratified by fish abundance.

Abundance	Averages by Observer										Averages by Crew			SD			
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	1–5	6–10	1–10	n	1–5	6–10	1–10
<100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0	ND	ND	ND
100–199	128	121	124	125	127	125	126	126	131	138	125	129	127	60	18	20	19
200–299	252	234	251	255	264	250	250	262	274	279	251	263	257	69	38	39	39
300–399	353	332	343	341	347	350	346	345	397	393	343	368	355	68	29	41	37
400–499	459	426	416	441	440	441	425	430	519	520	470	432	453	135	64	83	52
500–599	539	468	452	520	520	543	523	485	668	582	563	563	530	29	44	76	68
600–699	640	619	536	620	592	604	600	586	721	709	648	648	624	19	51	73	66
700–799	802	760	774	754	734	746	706	640	824	815	746	746	755	20	31	78	58
800–899	843	804	770	829	820	837	762	760	1,059	1,120	908	908	860	30	39	162	125
900–999	971	972	936	919	877	981	871	743	1,073	1,128	959	959	947	40	92	162	131
														470			
R <sup>2</sup>	0.991	0.978	0.946	0.996	0.988	0.984	0.989	0.950	0.979	0.942	correlation between observer and average for 1–10						
	0.994	0.992	0.970	0.993	0.983	-	-	-	-	-	correlation between counters 1–5 and average for 1–5						
	-	-	-	-	-	0.984	0.989	0.950	0.990	0.971	correlation between counters 6–10 and average for 6–10						

Note: Averages are calculated by abundance strata for each observer (number of sample files varies depending on abundance).

Table 14.–Late run sockeye salmon escapement weir and survey counts in 8 index streams, Kenai River drainage, 1969–2010.

Year	Railroad	Johnson	Carter-	Ptarmigan	Tern	Quartz Creek	Hidden	Above	Russian River	Total	
	Creek	Creek	Moose	Creek	(Mud)		Lake	Weir	Below	Index	
	ground	ground	Creek	ground	Lake <sup>a</sup>	weir	weir	Weir	Weir	Area	
			ground						ground		
1969	100	75	598	ND	437	ND	487	500	28,872	1,100	32,169
1970	99	118	348	ND	561	ND	200	323	26,200	222	28,071
1971	194	160	3,201	45	1,370	ND	808	1,958	54,421	11,442	73,599
1972	700	150	3,400	ND	1,200	ND	ND	4,956	79,115	7,113	96,634
1973	521	1,714	660	1,041	1,731	ND	3,173	690	25,068	6,680	41,278
1974	ND	46	942	558	1,216	ND	288	1,150	24,904	2,210	31,314
1975	572	105	1,278	186	1,214	ND	1,068	1,375	31,961	690	38,449
1976	1,162	ND	5,558	505	1,548	ND	3,372	4,860	31,939	3,470	52,414
1977	1,262	350	6,515	1,513	2,230	ND	3,037	1,055	21,362	17,090	54,414
1978	1,749	780	1,933	3,529	1,216	ND	10,627	4,647	34,334	18,330	77,145
1979	ND	588	3,986	532	1,693	ND	277	5,762	87,852	3,920	104,610
1980	1,259	253	4,879	5,752	2,575	ND	7,982	27,448	83,984	3,220	137,352
1981	1,286	142	4,363	1,421	3,402	ND	5,998	15,939	44,523	4,160	81,234
1982	2,518	498	4,752	7,525	4,337	70,540	ND	9,790	30,790	45,000	175,750
1983	1,289	338	1,819	9,709	ND	73,345	ND	11,297	33,734	44,000	175,531
1984	2,090	939	5,927	18,000	2,728	37,659	ND	27,784	92,659	3,000	190,786
1985	2,884	151	5,928	26,879	ND	ND	ND	24,784	136,969	8,650	206,245
1986	600	245	1,659	ND	ND	ND	ND	17,530	40,281	15,230	75,545
1987	736	74	628	14,187	ND	ND	45,400	43,487	53,932	76,530	234,974
1988	1,990	1,243	1,607	31,696	ND	ND	ND	50,907	42,476	30,360	160,279
1989	4,959	2,276	5,958	3,484	ND	ND	ND	7,770	138,377	28,480	191,304
1990	ND	ND	2,306	2,230	ND	ND	ND	77,959	83,434	11,760	177,689
1991	ND	ND	750	4,628	1,750	ND	ND	35,576	78,175	22,267	107,570
1992	ND	ND	1,106	3,147	970	ND	ND	32,912	62,584	4,980	105,699
1993	ND	ND	ND	ND	ND	ND	ND	11,582	99,259	12,258	123,099
1994	ND	705	ND	1,077	ND	ND	ND	6,086	122,277	15,211	145,356
1995	ND	ND	ND	ND	ND	ND	1,372	7,542	61,982	12,479	83,375
1996	ND	ND	ND	ND	ND	ND	4,181	55,256	34,691	31,601	125,729
1997	ND	ND	ND	ND	ND	ND	27,660	56,053	65,905	11,337	160,955

-continued-

Table 14.–Page 2 of 2.

Year	Railroad	Johnson	Carter-	Ptarmigan	Tern	Quartz Creek	Hidden	Above	Russian River	Total	
	Creek	Creek	Moose	Creek	(Mud)		Lake	Weir	Below	Index	
	ground	ground	Creek	ground	Lake <sup>a</sup>	weir	weir	Weir	Weir	Area	
1998	ND	ND	ND	ND	ND	ND	11,130	67,727	113,480	19,593	211,930
1999	ND	ND	ND	ND	ND	ND	3,951	49,406	139,863	19,514	212,734
2000	ND	ND	ND	ND	ND	ND	1,389	45,685	56,580	13,930	117,584
2001	ND	ND	ND	ND	ND	ND	4,792	42,462	74,964	17,044	139,262
2002	ND	ND	ND	ND	ND	ND	66,294	71,983	62,115	6,858	140,956
2003	ND	ND	ND	ND	ND	ND	19,106	11,734	157,469	27,474	215,783
2004	ND	ND	2,132	4,428	ND	ND	13,225	18,172	110,244	30,458	178,659
2005	ND	ND	358	3,036	ND	ND	6,580	13,000 <sup>b</sup>	59,473	29,048	98,495
2006	ND	ND	971	3,461	ND	ND	28,335	38,535	89,160	18,452	178,914
2007	ND	ND	ND	1,938	ND	ND	38,954	16,734	53,068	4,504	115,198
2008	ND	ND	ND	5,530	ND	ND	16,622	15,214	46,638	9,750	93,754
2009	ND	ND	ND	3,980	ND	ND	11,262	11,011	80,088	10,740	117,081
2010	ND	ND	ND	2,184	ND	ND	5,098	41,503	38,848	16,656	104,289

<sup>a</sup> Survey conducted on an unnamed stream at eastern end of Tern (Mud) Lake, USDA Forest Service, Seward, AK (1984–1992, 1994).

<sup>b</sup> Count is incomplete; hole discovered in weir on 8/11.

Table 15.–Climatological data for the Kasilof, Kenai, Crescent, and Yentna rivers, 1979–2010.

Year	Kasilof River				Kenai River				
	Water Gain (m)	Turbidity (cm)	Air °C	Water °C	Water Gain (m)	Turbidity (cm)	Air °C	Water °C	
1979	ND	ND	ND	ND	ND	ND	ND	ND	
1980	ND	ND	ND	ND	ND	ND	ND	ND	
1981	ND	ND	ND	ND	ND	ND	ND	ND	
1982	1.0	ND	12.0	10.2	0.5	ND	14.2	9.3	
1983	ND	ND	ND	ND	0.4	ND	ND	12.6	
1984	0.6	ND	ND	14.4	0.5	ND	ND	12.5	
1985	0.8	ND	ND	13.0	ND	ND	ND	ND	
1986	1.3	ND	ND	11.0	ND	ND	ND	ND	
1987	ND	ND	ND	ND	0.4	ND	14.7	9.3	
1988	ND	ND	ND	ND	0.3	ND	15.8	11.8	
1989	1.3	ND	16.6	13.3	0.8	73.9	15.1	6.8	
1990	0.8	ND	17.2	15.0	0.5	77.7	15.0	12.6	
1991	0.6	ND	15.7	13.3	0.2	89.9	13.4	12.8	
1992	0.8	ND	18.0	13.0	0.5	88.9	15.0	12.0	
1993	0.9	ND	19.0	6.2	0.7	99.8	16.6	13.0	
1994	1.5	ND	17.1	13.2	0.4	87.6	14.3	11.4	
1995	0.9	ND	16.0	12.5	0.4	101.6	14.1	11.1	
1996	1.0	ND	16.0	13.0	0.8	52.3	13.6	12.1	
1997	1.2	ND	19.0	16.0	0.3	66.5	14.0	14.0	
1998	0.9	ND	13.6	16.5	0.5	69.1	13.4	12.0	
1999	1.0	ND	13.4	14.6	0.4	74.2	13.9	12.5	
2000	1.0	ND	11.3	14.6	0.4	77.7	13.3	11.6	
2001	0.7	ND	18.6	15.5	0.4	80.0	13.8	12.4	
2002	1.1	ND	17.8	9.1	0.3	99.3	15.0	12.6	
2003	1.1	ND	17.1	10.4	0.5	58.4	15.1	12.3	
2004	1.1	ND	19.9	13.5	0.5	83.3	16.1	14.3	
2005	0.9	ND	19.6	14.8	0.2	109.2	14.1	14.2	
2006	0.9	ND	16.7	12.5	0.4	107.7	13.0	11.7	
2007	1.0	42.2	17.9	14.9	0.4	85.3	13.6	12.5	
2008	0.9	ND	16.0	11.3	0.4	92.7	12.5	10.6	
2009	1.2	ND	17.0	12.3	1.1	74.1	13.8	12.5	
2010	0.9	ND	15.8	12.2	0.4	99.1	13.2	10.2	
Summary 1979– 2009									
Ave.	1.0	ND	16.6	13.0	0.5	83.3	14.3	11.9	
Min	0.6	ND	11.3	6.2	0.2	52.3	12.5	6.8	
Max	1.5	ND	19.9	16.5	1.1	109.2	16.6	14.3	

-continued-

Table 15.–Page 2 of 2.

Year	Crescent River				Yentna River			
	Water Gain (m)	Turbidity (cm)	Air °C	Water °C	Water Gain (m)	Turbidity (cm)	Air °C	Water °C
1979	0.6	ND	ND	9.1	ND	ND	ND	ND
1980	ND	ND	ND	ND	ND	ND	ND	ND
1981	0.4	ND	10.6	19.2	ND	ND	ND	ND
1982	0.2	ND	9.6	18.1	ND	ND	ND	ND
1983	0.4	ND	14.0	7.4	ND	ND	ND	ND
1984	0.2	ND	18.1	9.6	ND	ND	ND	ND
1985	0.8	ND	14.0	7.2	0.8	ND	13.9	ND
1986	1.4	ND	12.4	8.9	1.4	ND	12.5	8.9
1987	ND	ND	ND	ND	ND	ND	ND	ND
1988	ND	ND	ND	ND	ND	ND	ND	ND
1989	0.5	26.2	15.0	8.5	1.5	ND	12.6	8.7
1990	0.4	23.1	15.3	10.6	ND	ND	ND	ND
1991	0.2	35.9	12.0	12.6	1.2	ND	8.3	8.6
1992	0.5	45.0	12.4	7.8	1.2	ND	9.6	8.1
1993	0.4	42.9	12.3	9.2	1.2	ND	13.2	9.8
1994	0.7	45.2	11.8	7.4	0.8	ND	11.7	9.1
1995	0.6	37.3	11.6	8.9	1.4	ND	11.9	9.1
1996	0.3	31.5	12.5	10.3	1.2	ND	10.4	9.2
1997	0.4	15.0	15.0	11.6	1.0	ND	17.2	9.7
1998	0.7	40.1	10.8	7.3	1.1	ND	15.8	8.9
1999	0.5	36.8	15.0	9.4	1.1	ND	14.1	9.4
2000	0.4	47.0	16.7	9.5	1.5	ND	13.2	9.5
2001	0.4	30.2	14.9	8.9	1.4	ND	13.4	9.3
2002	0.3	37.6	14.3	8.2	1.4	ND	13.9	10.4
2003	0.6	40.1	14.9	9.3	1.6	ND	17.2	9.9
2004	0.6	20.3	14.2	9.9	1.0	ND	13.1	9.9
2005	0.5	22.9	14.0	9.9	1.3	ND	12.1	10.3
2006	0.5	33.0	12.5	9.1	2.1	ND	7.3	9.6
2007	0.4	42.2	12.0	9.2	1.4	ND	7.4	10.0
2008	0.3	58.4	10.9	8.2	1.7	ND	6.2	8.8
2009	ND	ND	ND	ND	1.6	ND	6.2	9.4
2010	0.5	44.8	11.1	7.4	1.4	ND	8.6	7.0
Summary 1979–2009								
Ave.	0.5	35.5	13.3	9.8	1.3	ND	11.9	9.4
Min	0.2	15.0	9.6	7.2	0.8	ND	6.2	8.1
Max	1.4	58.4	18.1	19.2	2.1	ND	17.2	10.4

Note: Crescent did not operate in 2009 because of volcanic activity.

Table 16.—Estimated sockeye salmon migration into the Kasilof River, 2010.

Date	Sockeye		Pink Daily	Coho Daily	Chinook Daily	Date	Sockeye		Pink Daily	Cum	Coho		Chinook	
	Daily	Cum					Daily	Cum			Daily	Cum	Daily	Cum
15 Jun	2,523	2,523	0	0	0	16 Jul	12,513	134,267	0	0	0	0	0	0
16 Jun	1,124	3,647	0	0	0	17 Jul	22,498	156,765	0	0	0	0	0	0
17 Jun	646	4,293	0	0	0	18 Jul	16,532	173,297	0	0	0	0	0	0
18 Jun	570	4,863	0	0	0	19 Jul	7,727	181,024	0	0	0	0	0	0
19 Jun	672	5,535	0	0	0	20 Jul	8,371	189,395	0	0	0	0	0	0
20 Jun	698	6,233	0	0	0	21 Jul	7,247	196,642	0	0	0	0	0	0
21 Jun	2,116	8,349	0	0	0	22 Jul	6,177	202,819	0	0	0	0	0	0
22 Jun	4,493	12,842	0	0	0	23 Jul	5,453	208,272	0	0	0	0	0	0
23 Jun	9,993	22,835	0	0	0	24 Jul	7,142	215,414	0	0	0	0	0	0
24 Jun	9,481	32,316	0	0	0	25 Jul	2,513	217,927	0	0	0	0	0	0
25 Jun	5,757	38,073	0	0	0	26 Jul	1,427	219,354	0	0	0	0	0	0
26 Jun	7,165	45,238	0	0	0	27 Jul	3,409	222,763	0	0	0	0	0	0
27 Jun	8,073	53,311	0	0	0	28 Jul	5,741	228,504	0	0	0	0	0	0
28 Jun	1,991	55,302	0	0	0	29 Jul	2,849	231,353	0	0	0	0	0	0
29 Jun	3,017	58,319	0	0	0	30 Jul	2,363	233,716	0	0	0	0	0	0
30 Jun	6,758	65,077	0	0	0	31 Jul	3,615	237,331	0	0	0	0	0	0
1 Jul	2,286	67,363	0	0	0	1 Aug	2,684	240,015	0	0	0	0	0	0
2 Jul	2,134	69,497	0	0	0	2 Aug	5,603	245,618	0	0	0	0	0	0
3 Jul	3,863	73,360	0	0	0	3 Aug	1,784	247,402	0	0	0	0	0	0
4 Jul	3,289	76,649	0	0	0	4 Aug	1,271	248,673	0	0	0	0	0	0
5 Jul	6,044	82,693	0	0	0	5 Aug	2,472	251,145	0	0	0	0	0	0
6 Jul	1,097	83,790	0	0	0	6 Aug	3,167	254,312	0	0	0	0	0	0
7 Jul	2,475	86,265	0	0	0	7 Aug	1,829	256,141	197	197	0	0	130	130
8 Jul	2,671	88,936	0	0	0	8 Aug	2,179	258,320	401	598	57	57	115	245
9 Jul	1,541	90,477	0	0	0	9 Aug	1,297	259,617	260	858	65	122	162	407
10 Jul	3,230	93,707	0	0	0	10 Aug	705	260,322	172	1,030	58	180	133	540
11 Jul	2,457	96,164	0	0	0	11 Aug	1,013	261,335	217	1,247	72	252	253	793
12 Jul	7,298	103,462	0	0	0	12 Aug	1,280	262,615	247	1,494	49	301	296	1,089
13 Jul	4,078	107,540	0	0	0	13 Aug	1,437	264,052	186	1,680	0	301	185	1,274
14 Jul	6,729	114,269	0	0	0	14 Aug	1,468	265,520	53	1,733	0	301	157	1,431
15 Jul	7,485	121,754	0	0	0	15 Aug	1,493	267,013	67	1,800	0	301	68	1,499
Total: 270,613						Percent of Total:			98.7	0.7	0.1		0.6	

Note: Estimates are converted to Bendix equivalents and are not indicative of run strength for other species. Total DIDSON estimate was 299,433 salmon.

Table 17.—Cumulative proportion by date of salmon passage recorded in the Kasilof River, 1994–2010.

Date	Cumulative Proportion																
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
15 Jun	0.007	0.001	0.003	0.007	0.001	0.002	0.001	0.006	0.027	0.004	0.007	0.022	0.009	0.012	0.001	0.008	0.009
16 Jun	0.010	0.002	0.007	0.013	0.003	0.004	0.002	0.020	0.039	0.007	0.010	0.043	0.013	0.025	0.002	0.015	0.014
17 Jun	0.014	0.004	0.016	0.026	0.006	0.007	0.004	0.043	0.051	0.009	0.013	0.073	0.018	0.033	0.004	0.018	0.016
18 Jun	0.017	0.006	0.023	0.039	0.016	0.009	0.010	0.064	0.067	0.011	0.017	0.115	0.023	0.039	0.005	0.022	0.018
19 Jun	0.020	0.010	0.033	0.061	0.029	0.012	0.015	0.085	0.095	0.017	0.022	0.164	0.030	0.045	0.008	0.028	0.021
20 Jun	0.025	0.016	0.047	0.098	0.036	0.016	0.022	0.097	0.119	0.032	0.034	0.211	0.039	0.051	0.018	0.049	0.023
21 Jun	0.029	0.024	0.055	0.125	0.048	0.025	0.027	0.110	0.138	0.053	0.053	0.238	0.054	0.057	0.031	0.060	0.031
22 Jun	0.034	0.032	0.079	0.141	0.065	0.038	0.040	0.124	0.157	0.065	0.092	0.246	0.065	0.067	0.049	0.065	0.048
23 Jun	0.039	0.040	0.111	0.157	0.082	0.055	0.055	0.146	0.174	0.092	0.138	0.251	0.076	0.079	0.074	0.073	0.086
24 Jun	0.047	0.047	0.145	0.184	0.094	0.072	0.075	0.174	0.185	0.113	0.187	0.261	0.087	0.086	0.090	0.084	0.121
25 Jun	0.058	0.059	0.162	0.227	0.107	0.099	0.096	0.210	0.194	0.128	0.222	0.283	0.104	0.094	0.111	0.104	0.143
26 Jun	0.071	0.071	0.181	0.276	0.124	0.120	0.122	0.229	0.212	0.152	0.224	0.303	0.124	0.096	0.161	0.116	0.169
27 Jun	0.094	0.088	0.227	0.321	0.152	0.147	0.147	0.258	0.230	0.155	0.226	0.316	0.144	0.103	0.187	0.137	0.200
28 Jun	0.129	0.120	0.295	0.337	0.181	0.181	0.169	0.294	0.233	0.156	0.232	0.329	0.164	0.119	0.213	0.142	0.207
29 Jun	0.172	0.166	0.318	0.360	0.212	0.216	0.202	0.307	0.235	0.165	0.239	0.355	0.184	0.122	0.221	0.153	0.218
30 Jun	0.220	0.196	0.346	0.392	0.224	0.244	0.233	0.330	0.239	0.188	0.247	0.361	0.191	0.123	0.236	0.166	0.244
01 Jul	0.250	0.216	0.381	0.412	0.252	0.277	0.264	0.344	0.266	0.197	0.250	0.385	0.197	0.128	0.243	0.199	0.252
02 Jul	0.256	0.229	0.386	0.454	0.276	0.291	0.301	0.375	0.280	0.214	0.253	0.421	0.211	0.139	0.253	0.214	0.260
03 Jul	0.282	0.241	0.389	0.468	0.290	0.307	0.328	0.389	0.313	0.248	0.257	0.438	0.225	0.143	0.263	0.229	0.275
04 Jul	0.322	0.248	0.399	0.513	0.297	0.315	0.337	0.409	0.346	0.264	0.265	0.459	0.244	0.152	0.267	0.262	0.287
05 Jul	0.333	0.265	0.438	0.521	0.321	0.332	0.361	0.414	0.354	0.268	0.268	0.483	0.261	0.156	0.274	0.271	0.310
06 Jul	0.375	0.293	0.452	0.526	0.353	0.347	0.383	0.424	0.379	0.284	0.274	0.501	0.275	0.160	0.279	0.298	0.314
07 Jul	0.437	0.315	0.475	0.544	0.365	0.377	0.394	0.449	0.427	0.314	0.289	0.510	0.288	0.174	0.299	0.313	0.323
08 Jul	0.483	0.322	0.496	0.548	0.385	0.412	0.416	0.476	0.469	0.329	0.299	0.527	0.295	0.201	0.309	0.320	0.333
09 Jul	0.501	0.335	0.499	0.556	0.411	0.419	0.441	0.482	0.487	0.351	0.302	0.537	0.310	0.218	0.317	0.339	0.339
10 Jul	0.535	0.355	0.507	0.566	0.438	0.427	0.472	0.493	0.514	0.379	0.305	0.549	0.330	0.225	0.332	0.353	0.351
11 Jul	0.545	0.359	0.524	0.582	0.446	0.439	0.481	0.498	0.525	0.410	0.307	0.582	0.337	0.243	0.339	0.396	0.360
12 Jul	0.552	0.365	0.528	0.598	0.452	0.445	0.502	0.505	0.533	0.463	0.314	0.613	0.342	0.248	0.354	0.411	0.387
13 Jul	0.565	0.373	0.538	0.617	0.465	0.453	0.534	0.513	0.546	0.480	0.377	0.640	0.348	0.253	0.362	0.427	0.403
14 Jul	0.584	0.387	0.650	0.624	0.474	0.467	0.594	0.530	0.553	0.504	0.538	0.654	0.358	0.267	0.392	0.465	0.428
15 Jul	0.623	0.395	0.710	0.630	0.496	0.473	0.664	0.562	0.570	0.523	0.603	0.665	0.400	0.277	0.455	0.535	0.456
16 Jul	0.636	0.487	0.721	0.643	0.522	0.481	0.673	0.596	0.582	0.603	0.634	0.684	0.437	0.289	0.518	0.561	0.503
17 Jul	0.679	0.618	0.728	0.673	0.573	0.501	0.691	0.640	0.597	0.675	0.653	0.696	0.447	0.298	0.559	0.584	0.587
18 Jul	0.711	0.641	0.737	0.682	0.603	0.516	0.702	0.688	0.621	0.706	0.666	0.716	0.456	0.369	0.585	0.601	0.649
19 Jul	0.732	0.667	0.758	0.689	0.642	0.534	0.730	0.706	0.642	0.722	0.676	0.731	0.469	0.425	0.648	0.636	0.678

-continued-

Table 17.–Page 2 of 2.

Date	Cumulative Proportion																
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
19 Jul	0.732	0.667	0.758	0.689	0.642	0.534	0.730	0.706	0.642	0.722	0.676	0.7311	0.469	0.425	0.648	0.636	0.678
20 Jul	0.750	0.688	0.777	0.696	0.671	0.563	0.763	0.717	0.678	0.734	0.684	0.744	0.476	0.449	0.666	0.657	0.709
21 Jul	0.763	0.704	0.790	0.700	0.687	0.619	0.777	0.729	0.687	0.757	0.711	0.755	0.484	0.520	0.689	0.667	0.736
22 Jul	0.771	0.753	0.806	0.707	0.713	0.679	0.807	0.733	0.708	0.787	0.724	0.766	0.491	0.585	0.717	0.673	0.760
23 Jul	0.778	0.807	0.823	0.727	0.740	0.721	0.843	0.746	0.723	0.820	0.741	0.785	0.498	0.623	0.735	0.680	0.780
24 Jul	0.789	0.868	0.850	0.741	0.773	0.757	0.876	0.800	0.752	0.834	0.755	0.802	0.504	0.663	0.753	0.687	0.807
25 Jul	0.799	0.883	0.875	0.750	0.799	0.792	0.895	0.901	0.791	0.852	0.769	0.817	0.518	0.728	0.783	0.704	0.816
26 Jul	0.806	0.898	0.883	0.756	0.820	0.829	0.912	0.911	0.812	0.864	0.780	0.830	0.527	0.784	0.831	0.740	0.822
27 Jul	0.813	0.919	0.890	0.763	0.839	0.865	0.931	0.927	0.823	0.882	0.788	0.837	0.537	0.819	0.871	0.776	0.834
28 Jul	0.826	0.927	0.896	0.773	0.870	0.881	0.947	0.936	0.835	0.901	0.799	0.846	0.590	0.833	0.894	0.788	0.856
29 Jul	0.846	0.934	0.900	0.781	0.893	0.900	0.965	0.950	0.852	0.917	0.807	0.861	0.676	0.848	0.906	0.808	0.866
30 Jul	0.868	0.939	0.904	0.793	0.913	0.913	0.974	0.967	0.862	0.929	0.815	0.880	0.705	0.863	0.915	0.831	0.875
31 Jul	0.892	0.945	0.907	0.802	0.938	0.925	0.983	0.980	0.873	0.939	0.822	0.889	0.739	0.881	0.927	0.845	0.889
01 Aug	0.928	0.950	0.923	0.810	0.960	0.935	0.990	0.988	0.887	0.947	0.827	0.896	0.771	0.894	0.938	0.862	0.899
02 Aug	0.943	0.956	0.938	0.820	0.968	0.948	1.000	0.993	0.908	0.956	0.833	0.902	0.806	0.903	0.947	0.878	0.920
03 Aug	0.952	0.969	0.952	0.829	0.974	0.961		1.000	0.925	0.963	0.843	0.911	0.829	0.910	0.957	0.895	0.927
04 Aug	0.959	0.984	0.969	0.836	0.980	0.972			0.940	0.967	0.864	0.915	0.855	0.922	0.967	0.913	0.931
05 Aug	0.966	0.988	0.979	0.850	0.988	0.979			0.949	0.973	0.877	0.923	0.870	0.931	0.974	0.930	0.941
06 Aug	0.972	0.993	0.984	0.872	0.992	0.986			0.958	0.979	0.887	0.933	0.880	0.938	0.980	0.944	0.952
07 Aug	0.977	1.000	0.992	0.896	0.997	0.993			0.969	0.985	0.897	0.936	0.886	0.949	0.984	0.953	0.959
08 Aug	0.981		1.000	0.925	1.000	1.000			0.978	0.990	0.906	0.940	0.892	0.962	0.988	0.965	0.967
09 Aug	0.987			0.945					0.987	0.994	0.923	0.943	0.901	0.974	0.994	0.975	0.972
10 Aug	0.994			0.962					0.994	1.000	0.935	0.947	0.909	0.980	1.000	0.982	0.975
11 Aug	1.000			0.984					1.000		0.946	0.954	0.923	0.989		0.987	0.979
12 Aug				1.000							0.957	0.968	0.940	0.996		0.994	0.984
13 Aug											0.970	0.980	0.956	1.000		1.000	0.989
14 Aug											0.982	0.991	0.966				0.994
15 Aug											0.992	1.000	0.978				1.000
16 Aug											1.000		0.987				
17 Aug													0.994				
18 Aug													1.000				
Midpoint	9 Jul	17 Jul	10 Jul	4 Jul	16 Jul	17 Jul	12 Jul	12 Jul	10 Jul	14 Jul	14 Jul	6 Jul	24 Jul	21 Jul	16 Jul	15 Jul	16 Jul
Ave. (1979–2009):	15 Jul		(1994–2009):	14 July													
No. days																	
for 80%	35	30	37	49	36	34	31	35	44	35	47	46	46	37	35	41	40
80% Ave., (1979–2009):	39 d		(1994–2009):	39 d													

Table 18.—Daily fish wheel catch by species for the Kasilof River, 2010.

Date	Hours open	Sockeye		Pink		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	0.0	ND	ND	ND	ND	ND	ND	ND	ND
16 Jun	0.0	ND	ND	ND	ND	ND	ND	ND	ND
17 Jun	0.0	ND	ND	ND	ND	NDN	ND	ND	ND
18 Jun	18.0	2	2	0	0	0	0	0	0
19 Jun	19.6	2	4	0	0	0	0	0	0
20 Jun	20.0	0	4	0	0	0	0	0	0
21 Jun	19.8	6	10	0	0	0	0	0	0
22 Jun	22.6	19	29	0	0	0	0	0	0
23 Jun	7.6	25	54	0	0	0	0	0	0
24 Jun	3.2	50	104	0	0	0	0	0	0
25 Jun	7.1	137	241	0	0	0	0	0	0
26 Jun	0.0	ND	241	ND	0	ND	0	ND	0
27 Jun	13.3	62	303	0	0	0	0	0	0
28 Jun	13.0	31	334	0	0	0	0	0	0
29 Jun	15.2	5	339	0	0	0	0	0	0
30 Jun	9.9	21	360	0	0	0	0	0	0
1 Jul	8.7	11	371	0	0	0	0	0	0
2 Jul	14.2	10	381	1	1	0	0	0	0
3 Jul	24.6	33	414	0	1	0	0	0	0
4 Jul	9.3	18	432	0	1	0	0	0	0
5 Jul	16.2	25	457	0	1	0	0	0	0
6 Jul	5.7	9	466	0	1	0	0	0	0
7 Jul	14.0	16	482	0	1	0	0	0	0
8 Jul	10.3	52	534	0	1	0	0	0	0
9 Jul	5.9	9	543	0	1	0	0	0	0
10 Jul	11.5	62	605	0	1	0	0	1	1
11 Jul	8.2	3	608	0	1	0	0	0	1
12 Jul	9.9	59	667	0	1	0	0	0	1
13 Jul	5.7	85	752	0	1	0	0	0	1
14 Jul	8.2	11	763	0	1	0	0	0	1
15 Jul	6.8	14	777	0	1	0	0	0	1
16 Jul	5.7	100	877	0	1	0	0	0	1
17 Jul	4.5	133	1,010	0	1	0	0	0	1
18 Jul	2.3	68	1,078	0	1	0	0	0	1
19 Jul	6.6	75	1,153	0	1	0	0	0	1
20 Jul	4.4	19	1,172	0	1	0	0	0	1
21 Jul	2.3	36	1,208	0	1	0	0	0	1
22 Jul	9.5	10	1,218	0	1	0	0	0	1
23 Jul	8.5	2	1,220	0	1	0	0	0	1
24 Jul	25.1	30	1,250	0	1	0	0	0	1
25 Jul	16.7	6	1,256	0	1	0	0	0	1
26 Jul	23.7	58	1,314	0	1	0	0	0	1
27 Jul	8.9	10	1,324	0	1	0	0	0	1
28 Jul	15.5	29	1,353	0	1	0	0	0	1
29 Jul	23.8	16	1,369	0	1	0	0	0	1
30 Jul	24.1	7	1,376	0	1	0	0	2	3
31 Jul	17.7	10	1,386	1	2	0	0	1	4

-continued-

Table 18.–Page 2 of 2.

Date	Hours open	Sockeye		Pink		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Aug	21.8	5	1,391	0	2	0	0	2	6
2 Aug	9.7	12	1,403	0	2	0	0	0	6
3 Aug	25.5	10	1,413	0	2	0	0	0	6
4 Aug	20.5	14	1,427	0	2	0	0	1	7
5 Aug	25.3	7	1,434	2	4	0	0	1	8
6 Aug	26.0	11	1,445	0	4	0	0	0	8
7 Aug	20.3	10	1,455	1	5	0	0	1	9
8 Aug	20.9	17	1,472	6	11	1	1	1	10
9 Aug	23.5	13	1,485	1	12	1	2	3	13
10 Aug	20.9	7	1,492	2	14	1	3	3	16
11 Aug	25.0	8	1,500	3	17	0	3	1	17
12 Aug	21.8	11	1,511	0	17	0	3	2	19
13 Aug	22.7	12	1,523	1	18	0	3	1	20
14 Aug	24.0	5	1,528	0	18	0	3	0	20
15 Aug	27.9	5	1,533	0	18	0	3	0	20
Percent:			97.4		1.1		0.2		1.3
Total catch:	1,574	salmon		Hrs Operated:	863.5	CPUE (fish/hr):			1.8
Efficiency: 2.8% of total north bank count (fish wheel catch adjusted to 24 hrs).									

Note: Fish wheel not operated 15–17 June because of low water.

Table 19.–Summary of fish wheel catches and CPUE for the north bank of the Kasilof River, 1983–2010.

Year	Total Hours	Actual North Bank fish wheel catch (salmon only)								Total Catch	CPUE by species				Total CPUE
		Sockeye	%	Pink	%	Coho	%	Chinook	%		Sockeye	Pink	Coho	Chinook	
1983	582.5	2,094	96.8	26	1.2	2	0.1	41	1.9	2,163	3.6	0.0	0.0	0.1	3.7
1984	809.5	3,907	97.7	44	1.1	8	0.2	41	1.0	4,000	4.8	0.1	0.0	0.1	4.9
1985	747.0	4,996	98.3	49	1.0	4	0.1	32	0.6	5,081	6.7	0.1	0.0	0.0	6.8
1986	613.0	7,186	97.4	77	1.0	6	0.1	108	1.5	7,377	11.7	0.1	0.0	0.2	12.0
1987	768.4	3,910	96.2	20	0.5	0	0.0	136	3.3	4,066	5.1	0.0	0.0	0.2	5.3
1988	720.0	4,662	96.7	37	0.8	3	0.1	119	2.5	4,821	6.5	0.1	0.0	0.2	6.7
1989	959.1	4,017	94.0	154	3.6	5	0.1	99	2.3	4,275	4.2	0.2	0.0	0.1	4.5
1990	1,073.8	1,750	93.4	26	1.4	0	0.0	98	5.2	1,874	1.6	0.0	0.0	0.1	1.7
1991	557.7	1,889	95.9	65	3.3	1	0.1	14	0.7	1,969	3.4	0.1	0.0	0.0	3.5
1992	778.8	2,380	95.0	40	1.6	2	0.1	82	3.3	2,504	3.1	0.1	0.0	0.1	3.2
1993	840.0	2,100	93.9	52	2.3	0	0.0	85	3.8	2,237	2.5	0.1	0.0	0.1	2.7
1994	609.3	3,514	97.3	37	1.0	3	0.1	59	1.6	3,613	5.8	0.1	0.0	0.1	5.9
1995	678.2	2,023	96.4	28	1.3	1	0.0	46	2.2	2,098	3.0	0.0	0.0	0.1	3.1
1996	505.8	3,009	98.9	5	0.2	2	0.1	28	0.9	3,044	5.9	0.0	0.0	0.1	6.0
1997	505.0	2,076	97.0	16	0.7	3	0.1	46	2.1	2,141	4.1	0.0	0.0	0.1	4.2
1998	462.9	1,937	96.6	18	0.9	4	0.2	47	2.3	2,006	4.2	0.0	0.0	0.1	4.3
1999	503.0	1,952	92.1	108	5.1	2	0.1	58	2.7	2,120	3.9	0.2	0.0	0.1	4.2
2000	670.5	1,792	94.2	37	1.9	16	0.8	57	3.0	1,902	2.7	0.1	0.0	0.1	2.8
2001	391.4	1,765	96.4	23	1.3	1	0.1	42	2.3	1,831	4.5	0.1	0.0	0.1	4.7
2002	843.4	2,449	96.9	29	1.1	13	0.5	37	1.5	2,528	2.9	0.0	0.0	0.0	3.0
2003	822.2	1,704	98.3	15	0.9	0	0.0	14	0.8	1,733	2.1	0.0	0.0	0.0	2.1
2004	953.6	1,991	95.7	48	2.3	2	0.1	39	1.9	2,080	2.1	0.1	0.0	0.0	2.2
2005	785.1	1,812	95.5	66	3.5	0	0.0	19	1.0	1,897	2.3	0.1	0.0	0.0	2.4
2006	739.5	1,630	94.4	39	2.3	24	1.4	34	2.0	1,727	2.2	0.1	0.0	0.0	2.3
2007	877.3	1,580	97.8	15	0.9	4	0.2	17	1.1	1,616	1.8	0.0	0.0	0.0	1.8
2008	448.1	1,931	99.4	9	0.5	1	0.1	2	0.1	1,943	4.3	0.0	0.0	0.0	4.3
2009	514.2	1,390	96.8	42	2.9	0	0.0	4	0.3	1,436	2.7	0.1	0.0	0.0	2.8
2010	863.5	1,533	97.4	18	1.1	3	0.2	20	1.3	1,574	1.8	0.0	0.0	0.0	1.8
Ave. %: (1983–2009)			96.3		1.7		0.2		1.9		4.0	0.1	0.0	0.1	4.1
Min %: (1983–2009)			92.1		0.2		0.0		0.1		1.6	0.0	0.0	0.0	1.7
Max %: (1983–2009)			99.4		5.1		1.4		5.2		11.7	0.2	0.0	0.2	12.0
SD %: (1983–2009)			1.8		1.2		0.3		1.2		2.1	0.0	0.0	0.0	2.1

Table 20.—Age composition of sockeye salmon sampled from the Kasilof River fish wheel catch, 1969–2010.

Year	% Composition by Age Class								Sample Size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
1969	0.0	14.0	39.0	1.0	0.0	30.0	16.0	0.0	399
1970	0.0	2.0	37.0	2.0	0.0	16.0	11.0	2.0	297
1971	0.0	6.0	69.0	0.0	0.0	8.0	16.0	1.0	153
1972	0.0	42.0	36.0	1.0	0.0	3.0	18.0	0.0	668
1973	0.0	20.0	57.0	0.0	0.0	19.0	4.0	0.0	374
1974	0.0	35.0	59.0	0.0	0.0	4.0	2.0	0.0	254
1975	1.0	29.0	7.0	0.0	0.0	58.0	4.0	1.0	931
1976	0.2	35.9	24.1	0.0	0.0	28.2	11.4	0.2	755
1977	0.3	29.4	30.0	0.0	0.8	27.8	11.7	0.0	1,209
1978	0.0	41.3	40.1	0.0	0.0	10.4	8.2	0.0	967
1979	0.7	58.9	28.2	0.0	0.0	10.5	1.6	0.1	590
1980	2.1	67.0	23.1	0.1	0.0	5.0	2.7	0.0	899
1981	0.0	28.9	63.6	0.0	0.0	5.9	1.6	0.0	1,479
1982	0.8	30.6	54.4	0.0	0.2	9.3	4.7	0.0	1,518
1983	0.0	49.5	33.1	0.0	0.0	12.9	4.5	0.0	1,997
1984	0.0	50.5	24.8	0.0	0.2	17.9	6.6	0.0	2,269
1985	0.2	57.3	21.8	0.1	0.1	17.8	2.6	0.1	3,063
1986	0.0	40.9	42.0	0.3	0.1	11.9	4.6	0.2	1,660
1987	0.2	43.4	27.4	0.0	0.1	22.4	6.4	0.0	1,248
1988	0.1	33.7	36.4	0.2	0.1	17.6	12.0	0.0	2,282
1989	0.0	14.9	35.3	0.1	0.1	36.6	13.0	0.0	1,301
1990	0.4	32.9	20.7	0.3	0.0	33.2	12.4	0.3	762
1991	0.0	31.5	33.4	0.1	0.1	29.0	5.8	0.1	2,106
1992	0.0	21.1	27.5	0.0	0.2	35.3	16.0	0.0	1,717
1993	0.4	16.3	29.8	0.0	0.4	28.0	25.2	0.0	571
1994	0.0	26.4	28.4	0.0	0.0	28.2	17.0	0.0	723
1995	0.2	44.0	15.5	0.0	0.0	25.0	15.3	0.0	587
1996	0.0	24.8	48.3	0.0	0.0	21.4	5.6	0.0	721
1997	0.0	21.1	54.8	0.0	0.0	13.5	10.7	0.0	758
1998	0.1	39.7	28.1	0.4	0.6	22.2	8.9	0.0	857
1999	0.0	29.7	33.8	0.2	0.1	26.7	9.4	0.1	964
2000	0.1	41.9	33.9	0.0	0.4	11.4	12.3	0.0	747
2001	0.4	29.3	48.6	0.2	0.2	16.5	4.8	0.2	564
2002	0.3	33.9	38.1	0.3	1.5	19.3	6.6	0.1	746
2003	0.7	37.3	26.1	0.0	0.2	29.3	6.5	0.0	1,298
2004	0.1	43.7	18.9	0.1	0.2	32.6	4.3	0.1	908
2005	0.7	38.8	32.8	0.0	0.3	18.7	8.8	0.0	1,278
2006	0.5	35.3	30.5	0.0	0.4	27.4	5.8	0.1	737
2007	0.7	44.8	25.3	0.0	0.2	19.3	9.9	0.0	628
2008	0.4	39.5	38.3	0.0	0.2	17.9	3.7	0.0	448
2009	0.0	8.5	60.4	0.3	0.0	17.2	13.6	0.0	331
2010	1.1	27.7	31.2	0.0	1.5	31.2	7.1	0.2	477
Ave. (1969–2009)	0.3	33.4	35.6	0.2	0.2	20.6	8.9	0.1	1,019

Table 21.—Average lengths of the major age classes sampled from the Kasilof River fish wheel, 1980–2010.

Year	Male				Female				Ratio Male- Female	Age Class	Male				Female				Ratio Male- Female
	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size			Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size			
1980	474	189	464	376	467	565	0.5:1	1.3	531	35	516	115	520	150	0.3:1				
1981	503	241	492	146	499	387	1.7:1		566	422	558	369	562	791	1.1:1				
1982	481	285	466	235	474	520	1.2:1		549	377	542	428	545	805	0.9:1				
1983	493	113	491	78	492	191	1.4:1		558	170	547	187	552	357	0.9:1				
1984	480	544	478	428	479	972	2.6:1		539	304	533	383	535	687	0.8:1				
1985	474	723	472	897	473	1620	0.8:1		531	341	527	433	529	774	0.8:1				
1986	482	266	482	368	482	634	0.7:1		550	342	543	405	546	747	0.8:1				
1987	472	282	470	257	471	539	1.1:1		553	191	551	154	552	345	1.2:1				
1988	480	353	477	480	478	833	0.7:1		550	311	543	382	546	693	0.8:1				
1989	476	77	476	107	476	184	0.8:1		552	233	544	253	547	486	0.9:1				
1990	462	139	458	91	460	230	1.5:1		518	81	523	106	521	187	0.8:1				
1991	467	326	461	305	464	631	1.1:1		531	418	518	335	525	753	1.3:1				
1992	468	184	465	212	467	396	0.9:1		535	195	527	197	531	392	1.0:1				
1993	479	40	479	53	479	93	0.8:1		550	101	542	69	547	170	1.5:1				
1994	465	96	466	95	465	191	1.0:1		539	102	530	103	535	205	1.0:1				
1995	491	117	483	141	487	258	0.8:1		542	42	534	49	538	91	0.9:1				
1996	476	96	475	83	475	179	1.2:1		565	214	557	134	562	348	1.6:1				
1997	456	80	452	80	454	160	1.0:1		555	223	541	192	548	415	1.2:1				
1998	475	178	468	162	472	340	1.1:1		527	110	525	131	526	241	0.8:1				
1999	479	140	474	146	476	286	1.0:1		543	167	542	159	542	326	1.1:1				
2000	481	162	474	162	478	324	1.0:1		555	140	547	122	551	262	1.2:1				
2001	479	77	477	88	478	165	0.9:1		549	149	545	125	547	274	1.2:1				
2002	486	114	476	139	480	253	0.8:1		555	144	544	140	549	284	1.1:1				
2003	481	230	480	247	481	477	0.9:1		546	167	546	207	546	374	0.8:1				
2004	482	181	475	216	478	397	0.8:1		549	82	539	90	544	172	0.9:1				
2005	470	260	468	350	469	610	0.7:1		544	142	543	149	543	291	1:1				
2006	464	112	458	148	461	260	0.8:1		519	111	513	114	516	225	1.0:1				
2007	468	127	464	154	466	281	0.8:1		545	77	538	82	542	159	0.9:1				
2008	456	100	454	103	455	203	1.0:1		539	67	533	61	536	128	1.1:1				
2009	483	15	485	13	484	28	1.2:1		547	96	542	104	545	200	0.9:1				
2010	471	54	466	78	468	132	0.7:1		538	64	532	85	534	149	0.8:1				
Ave. (1980–2009)	476	195	472	212	474	407	0.9:1		544	185	538	193	541	378	1.0:1				

-continued-

Table 21.–Page 2 of 2.

Year	Male			Female		Total		Ratio Male- Female	Male			Female		Total		Ratio Male- Female	
	Age Class	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size		Age Class	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size		
1980	2.2	ND	ND	ND	ND	ND	ND	ND	2.3	ND	ND	ND	ND	ND	ND	ND	ND
1981		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND	ND
1982		479	65	472	81	475	146	0.8:1		548	41	543	40	546	81	1.0:1	
1983		ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND	546	ND	ND	
1984		484	202	482	223	483	425	0.9:1		533	102	526	80	530	182	1.3:1	
1985		482	248	476	319	479	567	0.8:1		ND	ND	ND	ND	ND	ND	ND	
1986		492	78	489	115	490	193	0.7:1		ND	ND	ND	ND	ND	ND	ND	
1987		478	137	474	141	476	278	1.0:1		548	37	541	44	544	81	0.8:1	
1988		486	173	479	220	482	393	0.8:1		544	104	543	115	543	219	0.9:1	
1989		479	200	480	253	479	453	0.8:1		535	94	537	82	536	176	1.1:1	
1990		453	104	457	111	455	215	0.9:1		514	63	529	61	522	124	1.0:1	
1991		471	289	480	301	475	590	1.0:1		516	61	514	64	515	125	1.0:1	
1992		464	264	465	427	464	691	0.6:1		534	112	532	122	533	234	0.9:1	
1993		486	58	480	102	482	160	0.7:1		542	66	533	78	537	144	0.8:1	
1994		469	96	470	108	470	204	0.9:1		545	49	528	74	535	123	0.7:1	
1995		492	61	485	86	488	147	0.7:1		546	42	536	48	541	90	0.9:1	
1996		482	69	472	85	476	154	0.8:1		553	21	556	19	554	40	1.1:1	
1997		459	47	450	55	454	102	0.9:1		546	39	526	42	536	81	0.9:1	
1998		473	95	469	95	471	190	1.0:1		523	40	519	36	521	76	1.1:1	
1999		480	125	475	132	477	257	1.0:1		538	41	530	50	534	91	0.8:1	
2000		486	36	482	52	483	88	0.7:1		551	47	551	48	551	95	1.0:1	
2001		482	41	473	52	477	93	0.8:1		556	17	540	10	550	27	1.7:1	
2002		480	50	470	94	473	144	0.5:1		550	25	546	24	548	49	1.0:1	
2003		481	162	479	186	480	348	0.9:1		546	39	537	53	541	92	0.7:1	
2004		482	126	475	170	478	296	0.7:1		536	25	523	14	531	39	1.8:1	
2005		478	109	467	165	472	274	0.7:1		544	40	533	48	539	88	0.8:1	
2006		464	82	466	120	465	202	0.7:1		527	21	521	22	524	43	1.0:1	
2007		465	53	462	68	463	121	0.8:1		526	36	517	26	522	62	1.4:1	
2008		462	41	458	56	460	97	0.7:1		532	11	501	6	520	17	1.8:1	
2009		481	23	480	34	481	57	0.7:1		544	24	531	21	538	45	1.1:1	
2010		472	59	474	90	473	149	0.7:1		526	19	521	15	524	34	1.3:1	
Ave. (1982–2009)		477	112	473	143	474	255	0.8:1		539	48	532	49	536	97	1.0:1	
2010 (all ages)		495	202	488	275	491	477	0.7:1									

Table 22.—Estimated minimum and maximum (DIDSON) migration ranges of salmon passage into the Yentna River drainage, 7 July–15 August, 2010.

Date	Sockeye				Pink			
	Min	Daily Max	Min	Cum Max	Min	Daily Max	Min	Cum Max
7 Jul	60	124	60	124	0	0	0	0
8 Jul	92	177	151	302	0	0	0	0
9 Jul	165	211	316	513	0	0	0	0
10 Jul	90	183	406	696	2	14	2	14
11 Jul	65	174	472	870	0	0	2	14
12 Jul	161	410	633	1,281	0	0	2	14
13 Jul	433	1,003	1,065	2,284	4	30	5	45
14 Jul	980	2,673	2,045	4,957	60	507	66	551
15 Jul	1,893	4,024	3,938	8,981	38	296	104	847
16 Jul	2,308	4,751	6,246	13,732	78	562	182	1,409
17 Jul	4,464	8,952	10,710	22,684	346	2,398	528	3,808
18 Jul	3,751	8,406	14,461	31,091	1,003	5,832	1,531	9,640
19 Jul	2,523	6,311	16,984	37,401	1,230	6,599	2,761	16,239
20 Jul	3,829	9,740	20,813	47,141	891	6,253	3,652	22,491
21 Jul	4,037	9,649	24,850	56,791	1,491	8,970	5,143	31,461
22 Jul	4,716	10,684	29,566	67,474	1,386	8,143	6,529	39,604
23 Jul	3,065	8,079	32,631	75,553	2,391	11,410	8,920	51,014
24 Jul	2,425	6,599	35,056	82,152	2,899	11,851	11,819	62,865
25 Jul	2,091	5,361	37,147	87,514	1,706	8,586	13,524	71,451
26 Jul	2,509	5,577	39,656	93,091	1,593	6,331	15,118	77,782
27 Jul	2,378	5,177	42,034	98,267	1,204	4,776	16,321	82,558
28 Jul	2,958	7,182	44,991	105,449	2,647	9,836	18,968	92,394
29 Jul	1,696	4,934	46,687	110,384	2,083	12,101	21,051	104,495
30 Jul	1,246	3,610	47,933	113,994	1,771	7,653	22,822	112,148
31 Jul	1,476	4,417	49,409	118,411	2,735	10,673	25,557	122,821
1 Aug	1,568	4,752	50,977	123,164	3,711	12,750	29,268	135,571
2 Aug	936	2,918	51,914	126,081	2,630	9,165	31,898	144,736
3 Aug	1,023	2,915	52,936	128,996	1,070	4,419	32,968	149,155
4 Aug	1,639	4,093	54,575	133,089	753	3,064	33,721	152,218
5 Aug	910	2,095	55,485	135,184	268	1,132	33,988	153,350
6 Aug	555	1,266	56,040	136,450	157	800	34,146	154,151
7 Aug	561	1,362	56,601	137,812	275	1,170	34,421	155,321
8 Aug	457	1,148	57,058	138,960	164	831	34,585	156,152
9 Aug	545	1,368	57,603	140,328	144	743	34,728	156,894
10 Aug	426	1,136	58,029	141,464	70	315	34,798	157,209
11 Aug	378	991	58,407	142,454	84	369	34,882	157,578
12 Aug	293	757	58,700	143,212	50	251	34,932	157,829
13 Aug	330	864	59,030	144,076	46	224	34,978	158,053
14 Aug	268	761	59,298	144,837	46	216	35,024	158,269
15 Aug	101	302	59,399	145,139	21	94	35,044	158,363
% Total of min & max:			33.9	24.1			20.0	26.3

-continued-

Table 22.–Page 2 of 2.

Date	Chum				Coho			
	Min	Daily Max	Min	Cum Max	Min	Daily Max	Min	Cum Max
7 Jul	2	9	2	9	19	86	19	86
8 Jul	0	0	2	9	23	108	42	194
9 Jul	2	9	4	18	19	68	61	262
10 Jul	8	37	12	55	30	139	91	401
11 Jul	18	77	30	132	59	196	150	597
12 Jul	6	31	37	163	93	351	243	948
13 Jul	152	572	188	735	223	955	465	1,903
14 Jul	387	1,501	575	2,236	1,059	3,643	1,525	5,546
15 Jul	555	2,099	1,130	4,336	789	3,527	2,314	9,073
16 Jul	486	1,901	1,616	6,236	852	4,018	3,166	13,091
17 Jul	435	1,680	2,051	7,916	1,741	8,044	4,907	21,134
18 Jul	1,032	3,385	3,083	11,301	2,294	10,560	7,201	31,695
19 Jul	616	2,064	3,699	13,365	2,495	10,493	9,696	42,188
20 Jul	682	2,611	4,381	15,977	3,749	14,303	13,445	56,491
21 Jul	907	2,923	5,287	18,899	2,639	12,526	16,084	69,016
22 Jul	1,010	3,395	6,297	22,295	2,625	12,636	18,709	81,652
23 Jul	1,288	3,762	7,586	26,057	2,789	13,424	21,498	95,076
24 Jul	1,431	3,751	9,016	29,808	2,041	11,066	23,540	106,142
25 Jul	894	2,412	9,911	32,220	1,044	6,577	24,583	112,718
26 Jul	677	1,844	10,588	34,064	668	4,588	25,251	117,307
27 Jul	529	1,423	11,117	35,487	332	2,627	25,583	119,934
28 Jul	1,318	3,477	12,436	38,964	975	6,710	26,558	126,644
29 Jul	2,435	5,990	14,870	44,955	1,248	8,182	27,806	134,826
30 Jul	1,898	4,418	16,768	49,373	1,338	7,246	29,145	142,072
31 Jul	3,308	7,316	20,076	56,688	1,947	10,461	31,092	152,533
1 Aug	4,506	9,591	24,582	66,279	1,906	10,939	32,998	163,472
2 Aug	2,892	6,651	27,474	72,931	1,830	9,105	34,828	172,577
3 Aug	2,964	6,411	30,438	79,342	1,211	6,164	36,039	178,742
4 Aug	2,147	5,298	32,585	84,639	920	4,910	36,959	183,652
5 Aug	984	2,240	33,568	86,879	242	1,538	37,201	185,190
6 Aug	312	849	33,880	87,728	235	1,270	37,437	186,460
7 Aug	736	1,621	34,616	89,349	204	1,268	37,640	187,729
8 Aug	696	1,577	35,311	90,926	249	1,341	37,890	189,069
9 Aug	929	2,082	36,240	93,008	300	1,603	38,190	190,673
10 Aug	981	1,942	37,221	94,951	147	832	38,336	191,504
11 Aug	895	1,741	38,116	96,691	139	829	38,476	192,333
12 Aug	727	1,516	38,844	98,207	181	946	38,657	193,279
13 Aug	911	1,802	39,755	100,009	179	959	38,836	194,239
14 Aug	1,353	2,537	41,108	102,546	299	1,475	39,135	195,714
15 Aug	548	917	41,657	103,462	66	380	39,200	196,094
% Total of min & max:			23.8%	17.2%			22.4%	32.5%

Note: Ranges derived from DIDSON subsample counts (not converted to Bendix equivalents).

Table 23.—Cumulative proportion by date of sockeye salmon passage recorded into the Yentna River, 1994–2010.

Date	Cumulative Proportion <sup>a</sup>																
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
07 Jul	0.002	0.001	0.001	0.004	0.003	0.000	0.007	0.005	0.029	0.004	0.002	0.007	0.004	0.000	0.001	0.001	0.001
08 Jul	0.004	0.001	0.003	0.006	0.006	0.001	0.013	0.010	0.101	0.007	0.004	0.017	0.006	0.001	0.002	0.003	0.002
09 Jul	0.008	0.002	0.005	0.009	0.010	0.002	0.020	0.015	0.155	0.010	0.006	0.021	0.009	0.001	0.004	0.004	0.004
10 Jul	0.010	0.003	0.007	0.011	0.017	0.005	0.024	0.023	0.187	0.014	0.007	0.028	0.013	0.002	0.006	0.008	0.005
11 Jul	0.013	0.004	0.007	0.013	0.030	0.010	0.033	0.029	0.207	0.018	0.008	0.035	0.018	0.002	0.007	0.013	0.007
12 Jul	0.016	0.005	0.009	0.016	0.043	0.017	0.046	0.041	0.226	0.023	0.010	0.041	0.022	0.002	0.010	0.024	0.009
13 Jul	0.020	0.006	0.011	0.030	0.051	0.024	0.075	0.050	0.236	0.051	0.011	0.057	0.024	0.004	0.013	0.045	0.016
14 Jul	0.022	0.006	0.013	0.087	0.056	0.031	0.124	0.058	0.251	0.126	0.014	0.081	0.026	0.004	0.017	0.074	0.034
15 Jul	0.024	0.007	0.022	0.149	0.059	0.044	0.263	0.068	0.271	0.192	0.092	0.109	0.027	0.005	0.068	0.113	0.063
16 Jul	0.026	0.007	0.131	0.197	0.064	0.057	0.407	0.098	0.328	0.239	0.263	0.131	0.031	0.006	0.148	0.189	0.098
17 Jul	0.029	0.012	0.348	0.229	0.072	0.068	0.490	0.184	0.446	0.261	0.377	0.147	0.042	0.009	0.228	0.281	0.163
18 Jul	0.056	0.022	0.519	0.254	0.094	0.081	0.600	0.270	0.535	0.316	0.457	0.165	0.087	0.013	0.299	0.336	0.223
19 Jul	0.115	0.068	0.614	0.280	0.159	0.108	0.730	0.359	0.570	0.372	0.519	0.205	0.160	0.015	0.387	0.377	0.266
20 Jul	0.167	0.160	0.671	0.316	0.239	0.160	0.849	0.414	0.628	0.489	0.555	0.242	0.217	0.040	0.538	0.416	0.332
21 Jul	0.250	0.251	0.702	0.367	0.304	0.222	0.910	0.423	0.684	0.611	0.573	0.273	0.239	0.091	0.636	0.459	0.399
22 Jul	0.297	0.335	0.745	0.434	0.327	0.319	0.950	0.429	0.734	0.678	0.593	0.303	0.257	0.160	0.700	0.497	0.474
23 Jul	0.333	0.378	0.784	0.492	0.338	0.433	0.969	0.480	0.754	0.706	0.619	0.326	0.285	0.251	0.779	0.531	0.529
24 Jul	0.397	0.426	0.822	0.544	0.357	0.510	0.978	0.563	0.783	0.747	0.657	0.365	0.307	0.320	0.821	0.567	0.573
25 Jul	0.426	0.496	0.856	0.606	0.378	0.567	0.984	0.630	0.807	0.783	0.681	0.430	0.325	0.374	0.851	0.591	0.609
26 Jul	0.517	0.580	0.880	0.668	0.403	0.605	0.989	0.704	0.820	0.813	0.711	0.485	0.353	0.417	0.862	0.609	0.649
27 Jul	0.557	0.678	0.899	0.697	0.426	0.653	0.994	0.803	0.835	0.844	0.722	0.516	0.390	0.450	0.868	0.623	0.686
28 Jul	0.599	0.743	0.913	0.722	0.454	0.702	0.996	0.880	0.855	0.865	0.729	0.532	0.459	0.514	0.878	0.646	0.736
29 Jul	0.662	0.796	0.928	0.743	0.493	0.767	0.996	0.921	0.871	0.881	0.739	0.555	0.564	0.564	0.890	0.684	0.768
30 Jul	0.712	0.832	0.941	0.767	0.560	0.804	0.997	0.944	0.891	0.892	0.756	0.581	0.630	0.589	0.897	0.734	0.792
31 Jul	0.750	0.852	0.943	0.795	0.622	0.848	0.999	0.954	0.906	0.909	0.781	0.628	0.698	0.603	0.907	0.756	0.820
01 Aug	0.788	0.875	0.948	0.826	0.684	0.878	1.000	0.970	0.918	0.941	0.792	0.677	0.733	0.619	0.914	0.787	0.851
02 Aug	0.830	0.897	0.954	0.852	0.762	0.895		0.985	0.931	0.963	0.809	0.718	0.769	0.647	0.924	0.838	0.870
03 Aug	0.862	0.915	0.965	0.870	0.830	0.914		0.991	0.947	0.977	0.826	0.766	0.825	0.687	0.939	0.881	0.889
04 Aug	0.889	0.928	0.981	0.893	0.876	0.934		0.994	0.964	0.983	0.851	0.792	0.867	0.725	0.959	0.915	0.918
05 Aug	0.919	0.944	0.991	0.911	0.907	0.947		1.000	0.979	0.990	0.882	0.810	0.897	0.743	0.973	0.932	0.932
06 Aug	0.942	0.975	0.996	0.923	0.927	0.955			0.990	1.000	0.910	0.844	0.919	0.758	0.981	0.947	0.941
07 Aug	0.962	0.990	1.000	0.931	0.938	0.963			0.996		0.934	0.895	0.948	0.790	0.986	0.962	0.950
08 Aug	0.974	0.992		0.945	0.947	0.971			1.000		0.953	0.917	0.970	0.826	0.989	0.977	0.958
09 Aug	0.984	0.996		0.961	0.953	0.978					0.968	0.948	0.982	0.871	0.994	0.986	0.968
10 Aug	0.992	1.000		0.982	0.959	0.988					0.981	0.968	0.989	0.898	1.000	0.992	0.975

-continued-

Table 23.–Page 2 of 2.

Date	Cumulative Proportion <sup>a</sup>																
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
11 Aug	0.996			0.992	0.966	0.994					0.993	0.979	0.994	0.933		0.995	0.982
12 Aug	1.000			1.000	0.973	0.997					1.000	0.992	1.000	0.975		1.000	0.987
13 Aug					0.979	0.999						1.000		0.991			0.993
14 Aug					0.984	1.000								0.994			0.998
15 Aug					0.986									0.997			1.000
16 Aug					0.988									1.000			
17 Aug					0.991												
18 Aug					0.993												
19 Aug					0.996												
20 Aug					0.998												
21 Aug					1.000												
Midpoint:	26 Jul	26 Jul	18 Jul	24 Jul	30 Jul	24 Jul	18 Jul	24 Jul	18 Jul	21 Jul	19 Jul	27 Jul	29 Jul	28 Jul	20 Jul	23 Jul	23 Jul
	Ave. (1981–2008): 24 July (1994–2009): 23 July																
No. days for 80%:	19	15	13	22	18	16	8	13	24	17	22	25	19	21	16	21	19
	80% Ave. (1981–2009): 16 d (1994–2009): 18 d																

Note: Data available back to 1981.

<sup>a</sup> Proportion averaged from minimum and maximum daily migration estimates for 2009 and 2010.

Table 24.—Daily fish wheel catch for the north bank of the Yentna River, 2010.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
7 Jul	17.4	2	2	0	0	0	0	1	1	0	0
8 Jul	17.3	5	7	0	0	0	0	1	2	2	2
9 Jul	17.7	4	11	0	0	0	0	0	2	1	3
10 Jul	17.7	10	21	1	1	1	1	3	5	0	3
11 Jul	17.8	12	33	0	1	3	4	5	10	0	3
12 Jul	17.7	10	43	0	1	0	4	5	15	1	4
13 Jul	17.7	14	57	1	2	6	10	8	23	1	5
14 Jul	17.9	34	91	23	25	18	28	59	82	0	5
15 Jul	18.1	52	143	22	47	24	52	50	132	2	7
16 Jul	17.6	60	203	33	80	24	76	36	168	1	8
17 Jul	17.4	97	300	109	189	32	108	84	252	4	12
18 Jul	17.5	56	356	204	393	37	145	81	333	0	12
19 Jul	17.4	56	412	401	794	35	180	109	442	0	12
20 Jul	17.5	92	504	284	1,078	30	210	140	582	1	13
21 Jul	17.5	116	620	423	1,501	54	264	98	680	3	16
22 Jul	17.7	122	742	408	1,909	42	306	131	811	2	18
23 Jul	17.6	111	853	701	2,610	59	365	159	970	0	18
24 Jul	17.5	66	919	816	3,426	62	427	110	1,080	0	18
25 Jul	16.0	47	966	512	3,938	33	460	60	1,140	0	18
26 Jul	17.0	43	1,009	287	4,225	25	485	34	1,174	0	18
27 Jul	17.4	54	1,063	207	4,432	31	516	15	1,189	0	18
28 Jul	17.5	83	1,146	431	4,863	64	580	67	1,256	0	18
29 Jul	17.2	51	1,197	478	5,341	80	660	74	1,330	0	18
30 Jul	17.2	68	1,265	469	5,810	59	719	111	1,441	0	18
31 Jul	17.5	71	1,336	564	6,374	93	812	132	1,573	0	18
1 Aug	17.4	77	1,413	688	7,062	105	917	78	1,651	0	18
2 Aug	17.4	68	1,481	635	7,697	128	1,045	85	1,736	0	18
3 Aug	17.5	40	1,521	341	8,038	147	1,192	80	1,816	0	18
4 Aug	17.4	41	1,562	216	8,254	70	1,262	32	1,848	0	18
5 Aug	17.0	31	1,593	61	8,315	30	1,292	12	1,860	1	19
6 Aug	17.1	36	1,629	44	8,359	12	1,304	18	1,878	0	19
7 Aug	17.5	29	1,658	103	8,462	40	1,344	22	1,900	0	19
8 Aug	17.3	43	1,701	82	8,544	59	1,403	22	1,922	0	19
9 Aug	17.5	68	1,769	95	8,639	72	1,475	41	1,963	0	19
10 Aug	16.9	31	1,800	21	8,660	48	1,523	5	1,968	0	19
11 Aug	17.5	25	1,825	30	8,690	56	1,579	10	1,978	0	19
12 Aug	17.4	20	1,845	16	8,706	43	1,622	13	1,991	0	19
13 Aug	17.3	37	1,882	27	8,733	93	1,715	17	2,008	1	20
14 Aug	16.9	37	1,919	25	8,758	130	1,845	44	2,052	0	20
15 Aug	16.9	27	1,946	19	8,777	60	1,905	15	2,067	0	20
16 Aug	19.4	16	1,962	10	8,787	44	1,949	8	2,075	0	20
17 Aug	19.8	7	1,969	4	8,791	18	1,967	3	2,078	0	20
18 Aug	17.6	13	1,982	3	8,794	5	1,972	0	2,078	0	20
19 Aug	17.6	11	1,993	5	8,799	13	1,985	7	2,085	0	20
20 Aug	18.0	12	2,005	5	8,804	11	1,996	4	2,089	0	20

-continued-

Table 24.–Page 2 of 2.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
21 Aug	17.9	17	2,022	2	8,806	9	2,005	2	2,091	0	20
22 Aug	17.3	3	2,025	7	8,813	5	2,010	2	2,093	1	21
23 Aug	17.4	5	2,030	3	8,816	5	2,015	4	2,097	0	21
24 Aug	18.0	4	2,034	1	8,817	2	2,017	3	2,100	0	21
25 Aug	17.8	1	2,035	1	8,818	2	2,019	1	2,101	0	21
26 Aug	15.1	1	2,036	1	8,819	4	2,023	2	2,103	0	21
27 Aug	15.2	0	2,036	1	8,820	0	2,023	0	2,103	0	21
28 Aug	15.5	0	2,036	1	8,821	1	2,024	2	2,105	0	21
29 Aug	15.2	1	2,037	0	8,821	0	2,024	0	2,105	0	21
30 Aug	15.1	0	2,037	0	8,821	3	2,027	3	2,108	0	21
31 Aug	14.8	0	2,037	0	8,821	1	2,028	1	2,109	0	21
1 Sep	15.1	0	2,037	0	8,821	1	2,029	1	2,110	0	21
2 Sep	14.4	1	2,038	0	8,821	2	2,031	0	2,110	0	21
Percent			13.6		58.7		13.5		14.0		0.1
Total catch:	15,021 salmon				Hrs Operated:	997.2			CPUE (fish/hr):	15.1	
<p>Other species include ~185 white fish, 19 longnose suckers and 17 rainbow trout. Burbot, Dolly Varden and northern pike were also caught in the fish wheel (&lt;5% combined).</p>											

Table 25.—Daily fish wheel catch by (all) species for the north bank (top) and south bank (bottom), Yentna River, 7 July–15 August, 2010.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
7 Jul	17.1	23	23	0	0	1	1	6	6	1	1
8 Jul	17.6	15	38	0	0	0	1	6	12	1	2
9 Jul	17.6	15	53	0	0	1	2	8	20	0	2
10 Jul	17.4	16	69	0	0	2	4	10	30	0	2
11 Jul	17.7	18	87	0	0	5	9	18	48	0	2
12 Jul	17.4	40	127	0	0	3	12	17	65	0	2
13 Jul	17.7	67	194	2	2	21	33	29	94	1	3
14 Jul	17.1	163	357	32	34	52	85	114	208	0	3
15 Jul	17.8	106	463	6	40	30	115	36	244	0	3
16 Jul	17.3	105	568	10	50	20	135	35	279	0	3
17 Jul	17.7	195	763	41	91	10	145	58	337	0	3
18 Jul	17.7	163	926	110	201	29	174	78	415	0	3
19 Jul	17.4	191	1,117	211	412	29	203	145	560	0	3
20 Jul	16.9	395	1,512	302	714	55	258	295	855	2	5
21 Jul	17.9	303	1,815	410	1,124	51	309	193	1,048	0	5
22 Jul	17.7	476	2,291	452	1,576	83	392	243	1,291	0	5
23 Jul	17.5	264	2,555	576	2,152	81	473	223	1,514	0	5
24 Jul	17.7	251	2,806	810	2,962	107	580	222	1,736	0	5
25 Jul	15.1	230	3,036	759	3,721	85	665	140	1,876	0	5
26 Jul	17.2	413	3,449	822	4,543	92	757	136	2,012	1	6
27 Jul	17.4	324	3,773	577	5,120	50	807	65	2,077	0	6
28 Jul	17.3	386	4,159	1,178	6,298	142	949	156	2,233	0	6
29 Jul	16.9	184	4,343	1,217	7,515	247	1,196	176	2,409	0	6
30 Jul	17.4	165	4,508	742	8,257	205	1,401	189	2,598	0	6
31 Jul	17.6	131	4,639	627	8,884	247	1,648	172	2,770	0	6
1 Aug	17.6	110	4,749	686	9,570	325	1,973	202	2,972	0	6
2 Aug	17.5	60	4,809	448	10,018	189	2,162	194	3,166	0	6
3 Aug	17.5	140	4,949	245	10,263	243	2,405	147	3,313	0	6
4 Aug	17.5	238	5,187	159	10,422	236	2,641	141	3,454	0	6
5 Aug	16.3	107	5,294	57	10,479	103	2,744	34	3,488	0	6
6 Aug	17.1	104	5,398	115	10,594	85	2,829	47	3,535	0	6
7 Aug	16.6	116	5,514	130	10,724	119	2,948	41	3,576	0	6
8 Aug	17.3	77	5,591	87	10,811	92	3,040	51	3,627	1	7
9 Aug	17.1	84	5,675	63	10,874	135	3,175	53	3,680	0	7
10 Aug	17.1	62	5,737	28	10,902	129	3,304	42	3,722	0	7
11 Aug	17.3	97	5,834	31	10,933	135	3,439	45	3,767	1	8
12 Aug	17.4	75	5,909	35	10,968	136	3,575	53	3,820	0	8
13 Aug	17.0	73	5,982	25	10,993	140	3,715	51	3,871	0	8
14 Aug	17.1	34	6,016	14	11,007	132	3,847	38	3,909	0	8
15 Aug	17.7	19	6,035	11	11,018	111	3,958	18	3,927	0	8
16 Aug	19.8	21	6,056	10	11,028	84	4,042	13	3,940	0	8
17 Aug	19.3	41	6,097	3	11,031	36	4,078	11	3,951	0	8
18 Aug	19.8	48	6,145	3	11,034	10	4,088	9	3,960	0	8
19 Aug	17.5	28	6,173	3	11,037	15	4,103	13	3,973	0	8
20 Aug	16.7	15	6,188	5	11,042	13	4,116	8	3,981	0	8

-continued-

Table 25.–Page 2 of 2.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
21 Aug	17.3	18	6,206	3	11,045	15	4,131	10	3,991	0	8
22 Aug	17.8	7	6,213	5	11,050	15	4,146	5	3,996	0	8
23 Aug	17.1	7	6,220	0	11,050	9	4,155	4	4,000	0	8
24 Aug	17.7	8	6,228	0	11,050	1	4,156	4	4,004	0	8
25 Aug	17.6	5	6,233	0	11,050	0	4,156	4	4,008	0	8
26 Aug	15.0	5	6,238	0	11,050	0	4,156	5	4,013	0	8
27 Aug	14.5	2	6,240	2	11,052	0	4,156	1	4,014	0	8
28 Aug	15.0	2	6,242	0	11,052	0	4,156	1	4,015	0	8
29 Aug	15.4	3	6,245	0	11,052	0	4,156	2	4,017	0	8
30 Aug	15.0	0	6,245	0	11,052	1	4,157	1	4,018	0	8
31 Aug	15.2	1	6,246	0	11,052	1	4,158	1	4,019	0	8
1 Sep	15.0	3	6,249	1	11,053	0	4,158	3	4,022	0	8
2 Sep	14.3	2	6,251	0	11,053	1	4,159	0	4,022	0	8
Percent			24.5		43.4		16.3		15.8		0.0
Total catch:	25,493 salmon				Hrs Operated:	992.0			CPUE (fish/hr):	25.7	

Table 26.—Summary of fish wheel catch and CPUE for the north bank of the Yentna River, 1982–2010.

	Total	Actual fish wheel catch - North bank										Total	CPUE by species					Total
	Hours	Sockeye	%	Pink	%	Chum	%	Coho	%	Chinook	%	Catch	Sockeye	Pink	Chum	Coho	Chinook	CPUE
1982	1,467.5	904	9.1	7,568	76.3	893	9.0	528	5.3	25	0.3	9,918	0.6	5.2	0.2	0.4	0.0	6.8
1983	1,564.5	933	22.0	2,667	62.8	384	9.0	213	5.0	50	1.2	4,247	0.6	1.7	0.5	0.1	0.0	2.7
1984	828.0	514	6.3	7,141	87.1	448	5.5	88	1.1	9	0.1	8,200	0.6	8.6	0.7	0.1	0.0	9.9
1985	702.5	1,099	17.5	4,415	70.4	502	8.0	241	3.8	14	0.2	6,271	1.6	6.3	0.6	0.3	0.0	8.9
1986	573.2	219	4.9	3,571	80.6	362	8.2	194	4.4	83	1.9	4,429	0.4	6.2	0.9	0.3	0.1	7.7
1987	936.4	1,393	25.5	2,983	54.5	876	16.0	172	3.1	47	0.9	5,471	1.5	3.2	2.8	0.2	0.1	5.8
1988	517.2	981	16.6	3,320	56.2	1,433	24.2	137	2.3	39	0.7	5,910	1.9	6.4	4.6	0.3	0.1	11.4
1989	790.2	2,016	13.8	8,099	55.3	3,669	25.1	803	5.5	46	0.3	14,633	2.6	10.2	2.3	1.0	0.1	18.5
1990	517.6	867	11.5	5,246	69.5	1,165	15.4	248	3.3	27	0.4	7,553	1.7	10.1	1.8	0.5	0.1	14.6
1991	530.1	768	16.2	2,071	43.8	946	20.0	932	19.7	15	0.3	4,732	1.4	3.9	2.3	1.8	0.0	8.9
1992	582.6	693	8.2	5,867	69.7	1,345	16.0	499	5.9	13	0.2	8,417	1.2	10.1	1.4	0.9	0.0	14.4
1993	399.1	931	13.9	4,789	71.3	549	8.2	432	6.4	17	0.3	6,718	2.3	12.0	1.5	1.1	0.0	16.8
1994	492.1	1,374	28.6	2,309	48.0	734	15.3	379	7.9	10	0.2	4,806	2.8	4.7	1.6	0.8	0.0	9.8
1995	511.8	815	17.8	2,343	51.0	826	18.0	587	12.8	19	0.4	4,590	1.6	4.6	0.9	1.1	0.0	9.0
1996	472.4	708	16.0	2,815	63.6	409	9.2	481	10.9	13	0.3	4,426	1.5	6.0	0.6	1.0	0.0	9.4
1997	849.5	2,294	48.1	1,610	33.8	551	11.6	301	6.3	14	0.3	4,770	2.7	1.9	1.0	0.4	0.0	5.6
1998	1,094.1	12,067	37.7	17,057	53.3	1,102	3.4	1,712	5.4	54	0.2	31,992	11.0	15.6	1.0	1.6	0.0	29.2
1999	206.0	1,004	33.5	1,301	43.4	211	7.0	464	15.5	16	0.5	2,996	4.9	6.3	1.2	2.3	0.1	14.5
2000	133.9	904	14.8	4,710	76.9	155	2.5	345	5.6	9	0.1	6,123	6.8	35.2	3.5	2.6	0.1	45.7
2001	145.1	898	13.6	4,705	71.4	501	7.6	477	7.2	13	0.2	6,594	6.2	32.4	3.2	3.3	0.1	45.4
2002	161.7	564	6.3	7,286	80.9	516	5.7	618	6.9	17	0.2	9,001	3.5	45.1	3.4	3.8	0.1	55.7
2003	179.5	2,331	34.5	3,367	49.9	602	8.9	442	6.5	12	0.2	6,754	13.0	18.8	1.4	2.5	0.1	37.6
2004	243.3	394	5.8	4,613	68.1	338	5.0	1,406	20.8	22	0.3	6,773	1.6	19.0	0.8	5.8	0.1	27.8
2005	314.3	582	13.2	2,131	48.5	250	5.7	1,420	32.3	13	0.3	4,396	1.9	6.8	0.8	4.5	0.0	14.0
2006	640.8	1,472	5.7	19,480	75.0	705	2.7	4,295	16.5	27	0.1	25,979	2.3	30.4	1.1	6.7	0.0	40.5
2007	242.9	554	14.4	2,349	61.1	152	4.0	786	20.4	6	0.2	3,847	2.3	9.7	0.6	3.2	0.0	15.8
2008	197.3	752	13.8	3,949	72.6	194	3.6	528	9.7	18	0.3	5,441	3.8	20.0	1.0	2.7	0.1	27.6
2009	631.4	1,061	1.9	50,671	91.5	1,262	2.3	2,363	4.3	33	0.1	55,390	1.7	80.3	2.0	3.7	0.1	87.7
2010	997.2	2,038	13.6	8,821	58.7	2,031	13.5	2,110	14.0	21	0.1	15,021	2.0	8.8	2.0	2.1	0.0	15.1
Ave.%(1982–09)			14.5		69.7		7.8		7.8		0.3		2.5	0.0	11.8	0.0	1.3	0.0
Min.%(1982–09)			1.9		33.8		2.3		1.1		0.1		0.4	1.7	0.2	0.1	0.0	2.7
Max.%(1982–09)			48.1		91.5		25.1		32.3		1.9		13.0	80.3	4.6	6.7	0.1	87.7
SD%(1982–09)			11.1		14.3		6.5		7.2		0.4		3.0	16.9	1.1	1.8	0.0	19.2

Table 27.—Summary of the fish wheel catch and CPUE for the south bank of the Yentna River, 1982–2010.

Year	Total Hours	Actual fish wheel catch - South bank										Total Catch	CPUE by species					Total CPUE
		Sockeye	%	Pink	%	Chum	%	Coho	%	Chinook	%		Sockeye	Pink	Chum	Coho	Chinook	
1982	1,440.0	2,502	19.7	9,059	71.3	368	2.9	675	5.3	102	0.8	12,706	1.7	6.3	0.3	0.5	0.1	8.8
1983	1,506.5	3,715	58.7	1,822	28.8	391	6.2	361	5.7	37	0.6	6,326	2.5	1.2	0.3	0.2	0.0	4.2
1984	788.3	5,985	29.5	13,114	64.6	635	3.1	568	2.8	12	0.1	20,314	7.6	16.6	0.8	0.7	0.0	25.8
1985	883.1	5,616	35.7	8,855	56.2	521	3.3	724	4.6	35	0.2	15,751	6.4	10.0	0.6	0.8	0.0	17.8
1986	608.8	973	13.3	5,422	73.9	589	8.0	327	4.5	28	0.4	7,339	1.6	8.9	1.0	0.5	0.0	12.1
1987	824.2	2,216	32.5	3,333	48.8	966	14.1	293	4.3	20	0.3	6,828	2.7	4.0	1.2	0.4	0.0	8.3
1988	529.4	2,457	26.9	4,536	49.6	1,635	17.9	494	5.4	20	0.2	9,142	4.6	8.6	3.1	0.9	0.0	17.3
1989	818.1	3,856	27.7	7,169	51.5	1,804	12.9	1,081	7.8	23	0.2	13,932	4.7	8.8	2.2	1.3	0.0	17.0
1990	542.2	4,201	32.2	7,058	54.1	1,129	8.6	657	5.0	11	0.1	13,056	7.7	13.0	2.1	1.2	0.0	24.1
1991	445.0	5,368	42.7	3,368	26.8	877	7.0	2,936	23.4	10	0.1	12,559	12.1	7.6	2.0	6.6	0.0	28.2
1992	612.9	3,887	22.2	9,966	56.8	1,940	11.1	1,737	9.9	9	0.1	17,539	6.3	16.3	3.2	2.8	0.0	28.6
1993	446.5	8,561	34.7	12,416	50.3	1,508	6.1	2,178	8.8	25	0.1	24,688	19.2	27.8	3.4	4.9	0.1	55.3
1994	651.3	8,251	55.6	3,763	25.4	1,260	8.5	1,553	10.5	12	0.1	14,839	12.7	5.8	1.9	2.4	0.0	22.8
1995	456.3	2,737	36.3	2,335	31.0	691	9.2	1,766	23.4	11	0.1	7,540	6.0	5.1	1.5	3.9	0.0	16.5
1996	306.5	2,498	28.7	4,335	49.7	752	8.6	1,119	12.8	15	0.2	8,719	8.1	14.1	2.5	3.7	0.0	28.4
1997	318.2	5,431	79.5	672	9.8	317	4.6	397	5.8	18	0.3	6,835	17.1	2.1	1.0	1.2	0.1	21.5
1998	1,114.4	14,394	34.5	21,258	51.0	1,667	4.0	4,326	10.4	50	0.1	41,695	12.9	19.1	1.5	3.9	0.0	37.4
1999	206.3	3,790	42.4	3,213	35.9	223	2.5	1,689	18.9	34	0.4	8,949	18.4	15.6	1.1	8.2	0.2	43.4
2000	125.4	2,611	19.6	9,494	71.4	123	0.9	1,051	7.9	15	0.1	13,294	20.8	75.7	1.0	8.4	0.1	106.0
2001	157.7	2,527	27.7	4,369	47.8	460	5.0	1,755	19.2	20	0.2	9,131	16.0	27.7	2.9	11.1	0.1	57.9
2002	140.7	2,716	14.8	11,590	63.3	712	3.9	3,274	17.9	16	0.1	18,308	19.3	82.4	5.1	23.3	0.1	130.2
2003	146.7	6,095	44.9	4,927	36.3	869	6.4	1,659	12.2	15	0.1	13,565	41.5	33.6	5.9	11.3	0.1	92.5
2004	203.0	2,712	17.4	8,147	52.3	835	5.4	3,832	24.6	43	0.3	15,569	13.4	40.1	4.1	18.9	0.2	76.7
2005	277.6	2,588	26.2	2,280	23.1	571	5.8	4,433	44.9	12	0.1	9,884	9.3	8.2	2.1	16.0	0.0	35.6
2006	636.4	9,277	26.4	15,261	43.4	862	2.5	9,747	27.7	34	0.1	35,181	14.6	24.0	1.4	15.3	0.1	55.3
2007	240.4	2,998	51.8	1,410	24.4	261	4.5	1,117	19.3	2	0.0	5,788	12.5	5.9	1.1	4.6	0.0	24.1
2008	210.7	2,696	36.9	3,245	44.4	349	4.8	1,022	14.0	4	0.1	7,316	12.8	15.4	1.7	4.9	0.0	34.7
2009	629.9	6,901	9.7	55,213	77.8	2,254	3.2	6,569	9.3	33	0.0	70,970	11.0	87.7	3.6	10.4	0.1	112.7
2010	992.0	6,251	24.5	11,053	43.4	4,159	16.3	4,022	15.8	8	0.0	25,493	6.3	11.1	4.2	4.1	0.0	25.7
Ave.%(1982–09)			28.5		53.1		5.5		12.8		0.1		8.4	0.0	15.6	0.0	1.6	0.0
Min.%(1982–09)			9.7		9.8		0.9		2.8		0.0		1.6	1.2	0.3	0.2	0.0	4.2
Max.%(1982–09)			79.5		77.8		17.9		44.9		0.8		41.5	87.7	5.9	23.3	0.2	130.2
SD%(1982–09)			15.2		17.2		3.9		9.5		0.2		8.2	23.5	1.4	6.2	0.0	33.7

Table 28.—Age composition of sockeye salmon sampled from fish wheels on the Yentna River, 1983–2010.

Year	Percentage Composition by Age Class <sup>a</sup>											Sample Size
	0.2	0.3	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	Other	
1983	0.4	0.4	4.7	66.9	22.6	0.2	0.9	1.7	1.7	0.0	0.5	1,024
1984	0.2	1.6	1.3	23.7	59.6	0.1	0.3	6.5	6.7	0.0	0.0	2,253
1985	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1986	1.0	1.1	0.0	21.2	65.3	0.2	0.3	4.7	6.2	0.0	0.0	688
1987	1.3	2.4	0.9	23.3	50.6	1.0	0.0	8.6	11.7	0.0	0.0	1,089
1988	2.7	2.4	0.4	33.5	41.9	0.2	1.7	6.5	10.4	0.1	0.0	1,727
1989	4.1	6.2	0.7	20.3	53.7	0.3	0.5	5.5	8.6	0.0	0.0	1,602
1990	0.8	2.4	0.3	29.9	47.6	0.7	0.1	9.8	8.2	0.1	0.2	1,916
1991	2.1	10.6	0.1	25.2	43.6	0.1	0.1	7.1	11.0	0.1	0.1	1,509
1992	1.6	0.7	1.0	31.4	29.2	0.1	0.4	17.1	18.2	0.1	0.4	1,451
1993	1.0	4.6	0.1	32.1	35.5	0.0	0.4	11.7	14.5	0.1	0.0	1,390
1994	1.3	3.9	0.6	23.2	43.2	0.2	0.0	9.7	17.6	0.0	0.3	637
1995	2.2	5.1	0.8	19.7	51.3	0.4	0.2	8.5	11.6	0.0	0.2	507
1996	3.2	3.2	0.4	25.5	43.8	0.0	0.4	9.4	14.0	0.0	0.0	466
1997	1.1	10.5	0.1	32.4	43.7	0.1	0.1	4.7	7.2	0.0	0.1	751
1998	0.7	5.7	0.3	15.7	62.7	0.3	0.0	4.0	10.5	0.0	0.0	1,500
1999	3.6	3.4	0.0	23.4	52.0	0.9	0.0	8.6	8.1	0.0	0.0	444
2000	0.0	5.9	0.0	8.6	61.5	0.2	0.0	3.3	20.2	0.2	0.0	546
2001	0.0	3.4	0.8	21.3	47.8	0.0	0.4	8.4	17.7	0.0	0.2	475
2002	1.7	2.0	0.7	28.8	51.0	0.0	0.0	5.5	10.2	0.0	0.2	459
2003	0.5	2.5	0.1	16.1	63.6	0.4	0.5	6.0	10.3	0.0	0.0	812
2004	0.6	1.1	0.7	17.0	50.0	0.6	0.0	8.3	21.7	0.0	0.0	460
2005	0.5	4.0	1.7	22.7	54.4	0.1	0.1	6.2	10.1	0.0	0.2	823
2006	2.2	3.1	0.5	44.0	39.3	0.2	0.0	5.0	5.8	0.0	0.0	605
2007	1.9	3.6	0.3	18.9	60.9	0.0	0.6	6.3	7.4	0.0	0.1	366
2008	0.8	6.3	1.6	11.8	56.0	0.5	1.1	7.6	13.9	0.0	0.4	382
2009	2.9	2.9	1.5	33.9	31.6	0.8	2.1	17.2	7.2	0.0	0.0	664
2010	12.5	4.2	1.6	39.4	23.3	0.0	1.5	5.8	11.5	0.0	0.2	879
Ave. (1983–2009)	1.8	3.8	0.8	27.4	47.1	0.3	0.5	7.7	10.6	0.0	0.1	896

Table 29.—Length composition of the major age classes of sockeye salmon sampled from the Yentna River fish wheels, 1983–2010.

Year	Age Class	Male		Female		Both		Ratio Male-Female
		Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	
1983	1.2	473	377	484	308	478	685	1.2:1
1986		455	104	472	52	460	156	2.0:1
1987		484	158	477	156	480	314	1.0:1
1988		465	408	485	170	471	578	2.4:1
1989		454	239	479	89	461	328	2.7:1
1990		446	305	446	238	446	543	1.3:1
1991		460	253	484	130	468	383	1.9:1
1992		444	360	470	115	450	475	3.1:1
1993		465	279	484	167	472	446	1.7:1
1994		468	107	484	41	473	148	2.6:1
1995		460	58	472	42	465	100	1.4:1
1996		463	78	469	41	465	119	1.9:0
1997		479	110	479	133	479	243	0.8:1
1998		485	104	486	132	486	236	0.8:1
1999		469	56	484	48	476	104	1.2:1
2000		462	35	458	12	461	47	2.9:1
2001		477	53	490	48	483	101	1.1:1
2002		486	76	495	56	490	132	1.4:1
2003		473	77	486	54	478	131	1.4:1
2004		466	53	490	25	474	78	2.1:1
2005		456	125	466	62	459	187	2.0:1
2006		485	134	487	132	486	266	1.0:1
2007		455	43	483	26	466	69	1.7:1
2008		456	40	482	5	459	45	8.0:1
2009		472	139	488	86	478	225	1.6:1
2010		462	208	478	138	468	346	1.5:1
Ave. (1986–09)		467	141	479	86	470	227	1.6:1
1983	1.3	577	134	548	98	565	232	1.4:1
1986		579	172	563	216	570	388	0.8:1
1987		590	246	565	222	579	468	1.1:1
1988		583	365	551	359	568	724	1.0:1
1989		578	392	555	450	565	842	0.9:1
1990		573	400	552	526	561	926	0.8:1
1991		562	301	542	356	551	657	0.8:1
1992		546	188	543	242	544	430	0.8:1
1993		561	228	549	266	554	494	0.9:1
1994		596	133	561	142	578	275	0.9:1
1995		568	124	545	136	556	260	0.9:1
1996		589	107	568	97	579	204	1.1:1
1997		585	155	555	173	569	328	0.9:1
1998		562	453	538	487	550	940	0.9:1
1999		581	135	553	96	569	231	1.4:1
2000		600	180	568	156	585	336	1.2:1
2001		586	111	555	116	570	227	1.0:1
2002		596	113	561	121	578	234	0.9:1
2003		576	270	548	246	563	516	1.1:1
2004		574	93	553	137	562	230	0.7:1
2005		568	222	546	226	557	448	1.0:1
2006		567	99	554	139	559	238	0.7:1
2007		575	109	552	114	563	223	1.0:1
2008		571	99	555	115	563	214	0.9:1
2009		580	92	557	118	567	210	0.8:1
2010		569	79	548	126	556	205	0.6:1
Ave. (1986–09)		576	199	554	219	565	418	0.9:1

-continued-

Table 29.–Page 2 of 2.

Year	Age Class	Male		Female		Both		Ratio Male-Female
		Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	
1983	2.2	490	13	507	5	495	18	2.6:1
1986		462	23	539	18	496	41	1.3:1
1987		480	48	490	76	487	124	0.6:1
1988		474	75	491	38	481	113	2.0:1
1989		479	45	490	48	485	93	0.9:1
1990		462	91	455	100	459	191	0.9:1
1991		478	57	477	50	478	107	1.1:1
1992		452	181	471	53	456	234	3.4:1
1993		476	93	487	69	481	162	1.3:1
1994		487	30	490	32	488	62	0.9:1
1995		472	23	488	20	479	43	1.2:1
1996		472	21	498	23	486	44	0.9:1
1997		497	15	460	20	475	35	0.8:1
1998		482	36	487	24	484	60	1.5:1
1999		483	16	491	22	487	38	0.7:1
2000		470	10	477	8	473	18	1.3:1
2001		487	19	482	21	485	40	0.9:1
2002		482	16	486	9	483	25	1.8:1
2003		472	23	486	26	480	49	0.9:1
2004		474	24	486	14	478	38	1.7:1
2005		462	29	488	22	473	51	1.3:1
2006		500	17	490	13	496	30	1.3:1
2007		471	8	493	15	486	23	0.5:1
2008		468	19	495	10	477	29	1.9:1
2009		492	73	495	41	493	114	1.8:1
2010		468	26	487	25	477	51	1.0:1
Ave. (1986–09)		476	41	487	32	481	74	1.3:1
1983	2.3	564	10	544	7	556	17	1.4:1
1986		588	25	555	44	567	69	0.6:1
1987		583	62	565	52	576	114	1.2:1
1988		587	92	558	87	574	179	1.1:1
1989		565	68	549	75	557	143	0.9:1
1990		574	73	542	96	555	169	0.8:1
1991		561	78	536	86	547	164	0.9:1
1992		564	123	538	126	551	249	1.0:1
1993		562	74	544	128	550	202	0.6:1
1994		600	56	561	56	580	112	1.0:1
1995		578	25	544	34	559	59	0.7:1
1996		585	31	558	34	571	65	0.9:1
1997		575	34	548	20	565	54	1.7:1
1998		558	82	534	76	547	158	1.1:1
1999		585	16	546	20	563	36	0.8:1
2000		597	55	563	55	580	110	1.0:1
2001		575	34	552	50	561	84	0.7:1
2002		589	21	551	26	568	47	0.8:1
2003		562	50	543	34	555	84	1.5:1
2004		579	41	551	59	560	100	0.7:1
2005		557	32	537	51	545	83	0.6:1
2006		562	13	553	22	556	35	0.6:1
2007		568	12	544	15	555	27	0.8:1
2008		565	26	535	27	550	53	1.0:1
2009		560	18	548	30	553	48	0.6:1
2010		559	39	545	62	551	101	0.6:1
Ave. (1986–09)		573	48	548	54	560	102	0.9:1

Note: No data collected in 1984 and 1985.

Table 30.–Index or weir counts of various northern district spawning areas for 2010.

Area	Number of Fish Observed or Estimated				
	Sockeye	Pink	Chum	Coho	Chinook
Alexander Creek (aerial survey, ADF&G-SF)	0	0	0	0	177
Answer Creek (foot survey, ADF&G-SF)	0	0	0	2	0
Birch Creek (foot survey, ADF&G-SF)	0	0	0	117	0
Caswell Lake (weir, CIAA)	0	0	0	0	0
Chelatna Lake (weir, CIAA)	37,734	0	0	0	0
Chuitna River (aerial survey, ADF&G-CF)	0	0	0	0	735
Chulitna River (aerial survey, ADF&G-SF)	0	0	0	0	1,052
Clear Creek (aerial survey, ADF&G-SF)	0	0	0	0	903
Cottonwood Creek (foot survey, ADF&G, SF)	0	0	0	756	0
Deshka River (weir, ADF&G SF)	0	0	0	10,393	18,594
Fish Creek (weir, ADF&G, SF)	126,836	0	0	6,977	0
Goose Creek (aerial survey, ADF&G, SF)	0	0	0	0	76
Jim Creek, Upper (foot survey, ADF&G, SF)	0	0	0	420	0
Judd Lake (weir, CIAA)	18,361	0	0	0	0
Lake Creek (aerial survey, ADF&G-SF)	0	0	0	0	1,617
Larson Lake (weir CIAA)	20,324	0	0	0	0
Lewis River (aerial survey, ADF&G-SF)	0	0	0	0	56
Little Susitna ( weir, ADF&G-SF)	0	0	0	9,214	589
Little Willow Creek (aerial survey, ADF&G-SF)	0	0	0	0	468
McRoberts Creek (foot survey, ADF&G, SF)	0	0	0	242	0
Montana Creek (aerial survey, ADF&G, SF)	0	0	0	0	755
Moose Creek (foot survey, ADF&G, SF)	0	0	0	0	142
Prairie Creek (aerial survey, ADF&G-SF)	0	0	0	0	3,022
Question Creek (foot survey, ADF&G, SF)	0	0	0	41	0
Rabideux Creek (foot survey, ADF&G, SF)	0	0	0	161	0
Shell Lake (weir, CIAA)	2,222	0	0	0	0
Sucker Lake (weir, CIAA)	0	0	0	0	0
Talachulitna River (aerial, ADF&G-CF)	0	0	0	0	1,499
Theodore River (aerial, ADF&G-CF)	0	0	0	0	202
Trapper Lake (weir, CIAA)	0	0	0	0	0
Wasilla Creek (foot survey, ADF&G, SF)	0	0	0	1,223	0
Willow Creek (aerial survey, ADF&G, SF)	0	0	0	0	1,173
Whiskey Lake (weir, CIAA)	58	0	0	0	0

Table 31.—Estimated salmon migration by species into the Crescent River, 24 June–5 August, 2010, using Bendix side-looking sonar.

Date	Sockeye		Pink		Chum		Chinook		Dolly Varden	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
24 Jun	3,107	3,107	0	0	0	0	0	0	0	0
25 Jun	1,144	4,251	0	0	0	0	0	0	0	0
26 Jun	4,092	8,343	0	0	0	0	0	0	0	0
27 Jun	2,690	11,033	0	0	0	0	0	0	0	0
28 Jun	4,011	15,044	0	0	0	0	0	0	0	0
29 Jun	2,692	17,736	0	0	0	0	0	0	0	0
30 Jun	2,571	20,307	0	0	0	0	0	0	0	0
1 Jul	2,393	22,700	0	0	0	0	0	0	0	0
2 Jul	2,314	25,014	0	0	0	0	0	0	0	0
3 Jul	1,801	26,815	0	0	0	0	0	0	0	0
4 Jul	2,678	29,493	0	0	0	0	0	0	0	0
5 Jul	2,254	31,747	0	0	0	0	0	0	20	20
6 Jul	2,952	34,699	0	0	0	0	0	0	0	20
7 Jul	2,491	37,190	0	0	0	0	0	0	0	20
8 Jul	1,077	38,267	0	0	0	0	0	0	12	32
9 Jul	3,032	41,299	0	0	21	21	0	0	21	53
10 Jul	2,600	43,899	0	0	0	21	0	0	100	153
11 Jul	3,954	47,853	0	0	0	21	0	0	0	153
12 Jul	2,892	50,745	0	0	67	88	0	0	0	153
13 Jul	2,315	53,060	0	0	33	121	0	0	0	153
14 Jul	2,477	55,537	0	0	0	121	0	0	0	153
15 Jul	1,731	57,268	0	0	0	121	0	0	0	153
16 Jul	2,615	59,883	0	0	0	121	0	0	0	153
17 Jul	2,149	62,032	53	53	54	175	0	0	0	153
18 Jul	2,588	64,620	0	53	0	175	0	0	56	210
19 Jul	1,976	66,596	0	53	100	275	0	0	0	210
20 Jul	2,652	69,248	0	53	40	315	0	0	80	290
21 Jul	1,616	70,864	126	179	63	378	32	32	0	290
22 Jul	1,619	72,483	227	406	112	490	0	32	38	328
23 Jul	1,937	74,420	221	627	122	612	20	52	20	348
24 Jul	2,066	76,486	249	876	177	789	0	52	142	491
25 Jul	1,280	77,766	49	925	296	1,085	0	52	345	835
26 Jul	1,542	79,308	0	925	694	1,779	0	52	77	912
27 Jul	909	80,217	0	925	373	2,152	0	52	140	1,052
28 Jul	605	80,822	0	925	241	2,393	0	52	60	1,113
29 Jul	658	81,480	0	925	219	2,612	0	52	94	1,207
30 Jul	857	82,337	22	947	113	2,725	0	52	90	1,297
31 Jul	641	82,978	0	947	121	2,846	0	52	20	1,317
1 Aug	774	83,752	31	978	167	3,013	0	52	0	1,317
2 Aug	929	84,681	21	999	191	3,204	0	52	14	1,331
3 Aug	557	85,238	16	1,015	80	3,284	0	52	16	1,347
4 Aug	424	85,662	15	1,030	64	3,348	0	52	7	1,354
5 Aug	671	86,333	31	1,061	122	3,470	0	52	31	1,385
Percent		93.5		1.1		3.8		0.1		1.5
Total count		92,301								

Note: Estimates for species other than sockeye salmon are not indicative of run strength for that species.

Table 32.—Cumulative percentage of fish timing into the Crescent River, 1992–2010.

Date	Cumulative Proportion																	
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010
22 Jun					0.001													
23 Jun					0.006													
24 Jun					0.008	0.004							0.023	0.012	0.001	0.005	0.001	0.036
25 Jun		0.010			0.011	0.014							0.036	0.034	0.001	0.010	0.001	0.049
26 Jun		0.019			0.012	0.020							0.045	0.050	0.002	0.012	0.002	0.097
27 Jun		0.022			0.013	0.029	0.009	0.001			0.016	0.037	0.062	0.065	0.024	0.021	0.003	0.128
28 Jun		0.031	0.001	0.000	0.015	0.037	0.016	0.002		0.006	0.072	0.071	0.088	0.079	0.045	0.078	0.003	0.174
29 Jun		0.034	0.002	0.000	0.018	0.049	0.022	0.007	0.001	0.008	0.112	0.108	0.127	0.092	0.070	0.104	0.006	0.205
30 Jun		0.038	0.008	0.002	0.036	0.058	0.031	0.038	0.002	0.016	0.149	0.139	0.139	0.110	0.091	0.145	0.008	0.235
01 Jul	0.045	0.056	0.012	0.002	0.060	0.067	0.034	0.086	0.006	0.036	0.186	0.159	0.153	0.134	0.112	0.168	0.014	0.263
02 Jul	0.072	0.061	0.015	0.003	0.074	0.091	0.038	0.115	0.008	0.074	0.225	0.172	0.182	0.151	0.124	0.210	0.055	0.290
03 Jul	0.096	0.077	0.017	0.006	0.087	0.153	0.040	0.137	0.011	0.136	0.271	0.182	0.215	0.169	0.132	0.232	0.078	0.311
04 Jul	0.115	0.183	0.028	0.010	0.105	0.188	0.043	0.161	0.028	0.199	0.310	0.205	0.240	0.199	0.143	0.255	0.124	0.342
05 Jul	0.138	0.239	0.035	0.012	0.129	0.214	0.044	0.184	0.093	0.253	0.351	0.225	0.266	0.224	0.158	0.271	0.145	0.368
06 Jul	0.153	0.246	0.044	0.022	0.148	0.239	0.045	0.204	0.178	0.307	0.398	0.246	0.289	0.238	0.170	0.293	0.159	0.402
07 Jul	0.159	0.258	0.061	0.029	0.161	0.267	0.056	0.215	0.292	0.338	0.440	0.307	0.306	0.253	0.185	0.310	0.210	0.431
08 Jul	0.173	0.273	0.086	0.052	0.174	0.300	0.084	0.247	0.365	0.356	0.465	0.323	0.325	0.272	0.205	0.324	0.260	0.443
09 Jul	0.192	0.297	0.092	0.082	0.181	0.348	0.142	0.267	0.399	0.383	0.480	0.337	0.342	0.295	0.221	0.341	0.320	0.478
10 Jul	0.212	0.314	0.103	0.106	0.189	0.429	0.196	0.278	0.410	0.399	0.489	0.351	0.358	0.321	0.241	0.359	0.384	0.508
11 Jul	0.243	0.353	0.132	0.132	0.197	0.500	0.237	0.284	0.418	0.449	0.497	0.356	0.391	0.344	0.268	0.393	0.412	0.554
12 Jul	0.292	0.386	0.170	0.169	0.202	0.550	0.272	0.328	0.422	0.471	0.521	0.376	0.438	0.362	0.290	0.418	0.472	0.588
13 Jul	0.335	0.423	0.214	0.204	0.262	0.581	0.294	0.375	0.426	0.505	0.562	0.492	0.506	0.393	0.312	0.437	0.526	0.615
14 Jul	0.379	0.501	0.251	0.250	0.391	0.606	0.320	0.403	0.433	0.557	0.614	0.526	0.578	0.422	0.344	0.453	0.585	0.643
15 Jul	0.424	0.580	0.276	0.281	0.471	0.625	0.348	0.410	0.444	0.595	0.628	0.554	0.622	0.436	0.397	0.471	0.632	0.663
16 Jul	0.463	0.642	0.295	0.317	0.513	0.654	0.389	0.458	0.494	0.638	0.648	0.587	0.648	0.448	0.421	0.486	0.653	0.694
17 Jul	0.512	0.685	0.368	0.364	0.551	0.691	0.434	0.548	0.658	0.677	0.673	0.624	0.672	0.473	0.439	0.518	0.684	0.719
18 Jul	0.539	0.723	0.395	0.400	0.595	0.719	0.487	0.600	0.795	0.697	0.682	0.687	0.696	0.506	0.449	0.580	0.730	0.748
19 Jul	0.573	0.752	0.425	0.417	0.653	0.734	0.546	0.645	0.863	0.706	0.707	0.729	0.718	0.532	0.462	0.612	0.771	0.771
20 Jul	0.610	0.772	0.453	0.440	0.692	0.747	0.590	0.703	0.882	0.727	0.732	0.754	0.741	0.549	0.504	0.649	0.795	0.802
21 Jul	0.653	0.797	0.460	0.494	0.729	0.759	0.606	0.729	0.924	0.765	0.784	0.785	0.759	0.589	0.537	0.696	0.828	0.821
22 Jul	0.701	0.821	0.487	0.598	0.746	0.774	0.622	0.780	0.940	0.803	0.809	0.806	0.775	0.616	0.560	0.720	0.860	0.840

-continued-

Table 32.–Page 2 of 2.

Date	Cumulative Proportion																	
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010
23 Jul	0.772	0.845	0.542	0.660	0.757	0.793	0.680	0.815	0.942	0.845	0.829	0.826	0.803	0.656	0.590	0.7453	0.876	0.862
24 Jul	0.831	0.865	0.581	0.692	0.775	0.814	0.714	0.841	0.948	0.871	0.835	0.842	0.814	0.685	0.601	0.7688	0.883	0.886
25 Jul	0.877	0.883	0.602	0.725	0.812	0.833	0.726	0.860	0.954	0.898	0.888	0.864	0.824	0.694	0.640	0.8164	0.896	0.901
26 Jul	0.898	0.908	0.624	0.756	0.864	0.847	0.742	0.881	0.960	0.930	0.929	0.888	0.833	0.738	0.672	0.8547	0.909	0.919
27 Jul	0.912	0.925	0.665	0.778	0.893	0.865	0.769	0.904	0.968	0.950	0.965	0.906	0.836	0.757	0.698	0.8749	0.924	0.929
28 Jul	0.928	0.942	0.696	0.803	0.910	0.885	0.785	0.933	0.969	0.958	0.987	0.917	0.843	0.781	0.722	0.8838	0.942	0.936
29 Jul	0.948	0.953	0.727	0.834	0.924	0.901	0.819	0.960	0.982	0.972	1.000	0.932	0.889	0.803	0.736	0.8923	0.958	0.944
30 Jul	0.960	0.969	0.766	0.883	0.948	0.926	0.853	0.969	0.985	0.983		0.947	0.914	0.845	0.754	0.9066	0.976	0.954
31 Jul	0.974	0.981	0.827	0.897	0.965	0.944	0.890	0.974	0.993	0.992		0.969	0.930	0.873	0.785	0.9249	0.982	0.961
01 Aug	0.987	0.990	0.875	0.907	0.985	0.959	0.919	0.979	1.000	1.000		0.978	0.949	0.891	0.820	0.9367	0.992	0.970
02 Aug	1.000	1.000	0.914	0.915	1.000	0.972	0.934	0.988				0.987	0.965	0.903	0.850	0.9473	1.000	0.981
03 Aug			0.928	0.939		0.983	0.949	0.992				1.000	0.979	0.923	0.901	0.957		0.987
04 Aug			0.949	0.964		0.991	0.962	1.000					0.992	0.946	0.917	0.971		0.992
05 Aug			0.975	0.980		1.000	0.977						1.000	0.956	0.936	0.981		1.000
06 Aug			0.983	0.987			0.990							0.972	0.948	0.991		
07 Aug			0.989	0.993			1.000							1.000	0.965	1.000		
08 Aug			1.000	1.000											0.976			
09 Aug															0.989			
10 Aug															1.000			
Midpoint	17 Jul	14 Jul	23 Jul	22 Jul	16 Jul	11 Jul	19 Jul	27 Jul	17 Jul	13 Jul	12 Jul	14 Jul	13 Jul	18 Jul	20 Jul	17 Jul	13 Jul	10 Jul
Ave. midpoint (1984–2008):	17 Jul		(1992–2008): 16 July															
No. days for 80%	23	23	24	23	22	27	24	26	16	24	28	28	31	33	34	32	24	29
Average for 80% of the run (1984–2008):	25 d		(1992–2008): 26 d															

Note: No data available for 2009.

Table 33.—Crescent River fish wheel catch, 2010.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook		DV	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
24 Jun	24.00	0	0	0	0	0	0	0	0	0	0	0	0
25 Jun	24.00	0	0	0	0	0	0	0	0	0	0	0	0
26 Jun	24.00	1	1	0	0	0	0	0	0	0	0	0	0
27 Jun	21.00	6	7	0	0	0	0	0	0	0	0	0	0
28 Jun	20.00	63	70	0	0	0	0	0	0	0	0	0	0
29 Jun	17.00	61	131	0	0	0	0	0	0	0	0	0	0
30 Jun	11.00	20	151	0	0	0	0	0	0	0	0	0	0
1 Jul	14.25	13	164	0	0	0	0	0	0	0	0	0	0
2 Jul	8.00	7	171	0	0	0	0	0	0	0	0	0	0
3 Jul	24.50	10	181	0	0	0	0	0	0	0	0	0	0
4 Jul	23.50	20	201	0	0	0	0	0	0	0	0	0	0
5 Jul	25.50	112	313	0	0	0	0	0	0	0	0	1	1
6 Jul	14.00	82	395	0	0	0	0	0	0	0	0	0	1
7 Jul	18.00	44	439	0	0	0	0	0	0	0	0	0	1
8 Jul	25.00	87	526	0	0	0	0	0	0	0	0	1	2
9 Jul	17.00	290	816	0	0	2	2	0	0	0	0	2	4
10 Jul	4.00	26	842	0	0	0	2	0	0	0	0	1	5
11 Jul	1.00	82	924	0	0	0	2	0	0	0	0	0	5
12 Jul	1.00	43	967	0	0	1	3	0	0	0	0	0	5
13 Jul	3.50	12	979	0	0	1	4	0	0	0	0	0	5
14 Jul	10.75	53	1,032	0	0	0	4	0	0	0	0	0	5
15 Jul	6.00	122	1,154	0	0	0	4	0	0	0	0	0	5
16 Jul	3.75	33	1,187	0	0	0	4	0	0	0	0	0	5
17 Jul	5.25	40	1,227	1	1	1	5	0	0	0	0	0	5
18 Jul	6.25	46	1,273	0	1	0	5	0	0	0	0	1	6
19 Jul	7.75	59	1,332	0	1	3	8	0	0	0	0	0	6
20 Jul	6.25	66	1,398	0	1	1	9	0	0	0	0	2	8
21 Jul	8.25	51	1,449	4	5	2	11	0	0	1	1	0	8
22 Jul	13.75	43	1,492	6	11	3	14	0	0	0	1	1	9
23 Jul	11.75	2	1,494	1	12	1	15	0	0	0	1	0	9
24 Jul	23.25	13	1,507	0	12	1	16	0	0	0	1	3	12
25 Jul	23.25	11	1,518	0	12	4	20	0	0	0	1	4	16
26 Jul	23.00	20	1,538	0	12	9	29	0	0	0	1	1	17
27 Jul	13.25	8	1,546	0	12	3	32	0	0	0	1	1	18
28 Jul	24.25	2	1,548	0	12	0	32	0	0	0	1	1	19
29 Jul	24.25	11	1,559	0	12	4	36	0	0	0	1	1	20
30 Jul	20.75	38	1,597	1	13	5	41	0	0	0	1	4	24
31 Jul	7.50	63	1,660	0	13	12	53	0	0	0	1	2	26
1 Aug	6.75	51	1,711	2	15	11	64	0	0	0	1	0	26
2 Aug	12.50	17	1,728	1	16	4	68	0	0	0	1	0	26
3 Aug	12.00	35	1,763	1	17	5	73	0	0	0	1	1	27
4 Aug	12.00	8	1,771	0	17	0	73	0	0	0	1	0	27
5 Aug	7.00	44	1,815	2	19	8	81	0	0	0	1	2	29
∑:		93.3		1.0		4.2		0.0		0.1		1.3	
Totals:	Catch (fish):			1,945	Time Operated (hrs):	609.75	CPUE (fish/hr):			3.2			

Table 34.—Historic fish wheel catch for the Crescent River, 1993–2010.

Year	Actual fish wheel catch														CPUE by Species				
	Total Hours	Sockeye		Pink		Chum		Coho		Chinook		DV		Total Catch	Sockeye	Pink	Coho	Chinook	CPUE
		Total	%	Total	%	Total	%	Total	%	Total	%	Total	%						
1993	359.0	2,336	78.9	211	7.1	269	9.1	0	0.0	0	0.0	146	4.9	2,962	6.5	0.6	0.0	0.0	8.3
1994	918.5	1,269	59.8	34	1.6	256	12.1	6	0.3	8	0.4	548	25.8	2,121	1.4	0.0	0.0	0.0	2.3
1995	775.0	1,539	81.7	55	2.9	126	6.7	14	0.7	17	0.9	132	7.0	1,883	2.0	0.1	0.0	0.0	2.4
1996	1,005.0	1,028	79.2	7	0.5	109	8.4	2	0.2	6	0.5	146	11.2	1,298	1.0	0.0	0.0	0.0	1.3
1997	1,031.0	1,575	79.1	290	14.6	51	2.6	0	0.0	5	0.3	69	3.5	1,990	1.5	0.3	0.0	0.0	1.9
1998	1,007.0	2,059	93.8	32	1.5	65	3.0	6	0.3	16	0.7	18	0.8	2,196	2.0	0.0	0.0	0.0	2.2
1999	936.0	1,307	53.9	588	24.3	58	2.4	0	0.0	48	2.0	423	17.5	2,424	1.4	0.6	0.0	0.1	2.6
2000	786.0	646	91.9	9	1.3	7	1.0	2	0.3	4	0.6	35	5.0	703	0.8	0.0	0.0	0.0	0.9
2001	860.0	527	83.1	30	4.7	23	3.6	0	0.0	2	0.3	52	8.2	634	0.6	0.0	0.0	0.0	0.7
2002	611.0	1,017	82.1	10	0.8	18	1.5	0	0.0	8	0.6	186	15.0	1,239	1.7	0.0	0.0	0.0	2.0
2003	450.0	2,278	84.1	62	2.3	214	7.9	4	0.1	25	0.9	125	4.6	2,708	5.1	0.1	0.0	0.1	6.0
2004	176.5	1,582	92.6	30	1.8	28	1.6	1	0.1	11	0.6	57	3.3	1,709	9.0	0.2	0.1	0.0	9.7
2005	403.0	2,844	90.2	157	5.0	24	0.8	1	0.0	27	0.9	99	3.1	3,152	7.1	0.4	0.0	0.1	7.8
2006	841.0	2,210	92.4	61	2.6	48	2.0	10	0.4	8	0.3	54	2.3	2,391	2.6	0.1	0.0	0.0	2.8
2007	1,032.0	769	90.4	20	2.4	4	0.5	1	0.1	1	0.1	56	6.6	851	0.7	0.0	0.0	0.0	0.8
2008	892.0	582	95.7	3	0.5	7	1.2	0	0.0	11	1.8	5	0.8	608	0.7	0.0	0.0	0.0	0.7
2010	609.8	1,815	93.3	19	1.0	81	4.2	0	0.0	1	0.1	29	1.5	1,945	3.0	0.0	0.0	0.0	3.2
Ave (1993–2008):	755.2	1,473	81.6	100	5.5	82	4.5	3	0.2	12	0.7	134	7.5	1,804	2.0	0.1	0.1	0.0	2.4
Min (1993–2008):	176.5	527	53.9	3	0.5	4	0.5	0	0.0	0	0.0	5	0.8	608	0.6	0.0	0.0	0.0	0.7
Max (1993–2008):	1,032.0	2,844	95.7	588	24.3	269	12.1	14	0.7	48	2.0	548	25.8	3,152	9.0	0.6	0.1	0.1	9.7
SD (1993–2008):	-	-	11.8	-	6.3	-	3.6	-	0.2	-	0.5	-	6.8	-	2.6	0.2	0.0	0.0	2.9

Note: No data available for 2009.

Table 35.—Age composition of sockeye salmon sampled from the Crescent River, 1979–2010.

Year	% Composition by Age Class								Sample Size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
1979	0.8	30.9	67.4	0.1	0.1	0.7	0.0	0.0	643
1980	0.0	6.6	87.4	1.8	0.0	2.6	1.6	0.0	511
1981	0.0	8.0	34.0	0.1	0.1	10.6	47.2	0.0	1,117
1982	0.0	12.9	79.2	0.1	0.0	0.8	7.0	0.0	711
1983	0.0	10.9	42.3	0.2	0.6	27.4	18.6	0.0	731
1984	0.0	3.5	16.9	0.0	0.0	20.0	59.4	0.2	780
1985	0.2	4.7	31.3	0.0	0.3	20.5	43.0	0.0	594
1986	0.0	6.5	15.8	0.0	0.0	13.0	64.0	0.7	139
1987	0.0	2.6	47.7	0.0	0.0	4.2	45.0	0.5	191
1988	0.0	10.4	44.9	0.5	0.1	17.8	26.1	0.1	741
1989	0.0	0.7	45.4	0.1	0.0	2.0	51.2	0.6	711
1990	0.0	3.7	48.5	0.4	0.1	3.5	43.2	0.6	591
1991	0.0	14.9	50.4	0.3	0.0	16.8	16.5	1.1	357
1992	0.0	2.6	21.7	0.0	0.0	12.4	61.9	1.5	194
1993	0.2	8.8	37.2	0.0	0.9	5.8	46.9	0.2	465
1994	0.2	6.6	49.6	0.4	0.4	12.3	30.5	0.2	547
1995	0.4	9.2	18.4	0.6	0.2	9.4	61.7	0.2	543
1996	0.0	15.3	25.4	0.0	0.0	23.9	34.9	0.5	393
1997	0.0	10.6	55.9	0.0	0.2	6.6	26.6	0.1	640
1998	0.0	9.9	44.5	0.4	0.0	10.1	35.2	0.0	577
1999	0.0	21.4	39.4	0.4	0.1	9.2	29.3	0.2	912
2000	0.0	2.5	72.8	0.0	0.0	2.2	22.4	0.0	357
2001	0.0	15.7	21.0	0.9	0.5	22.7	38.8	0.4	572
2002	0.0	19.1	33.7	0.3	0.1	11.2	35.5	0.1	750
2003	0.4	14.4	51.1	0.0	0.3	13.4	20.3	0.1	1,080
2004	0.0	14.1	31.3	0.2	0.0	16.0	38.0	0.4	489
2005	0.4	13.3	51.6	0.0	0.0	8.7	25.8	0.2	562
2006	0.0	14.3	42.6	0.0	0.0	7.0	36.2	0.0	484
2007	1.1	8.3	64.4	0.2	1.3	3.5	21.2	0.0	458
2008	0.3	17.7	53.4	0.3	2.8	9.9	15.5	0.1	322
2010	0.2	10.4	37.5	0.2	0.2	15.1	36.4	0.0	451
Ave. (1979–2008)	0.1	11.3	44.6	0.2	0.2	11.0	32.3	0.2	581

Note: No data available for 2009.

Table 36.—Summary by year of average lengths and male to female ratios of sockeye salmon sampled from the Crescent River between 1987 and 2010.

Year	Age Class	Male		Female		Both		Ratio Male: Female
		Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	
1987	1.2	507	3	457	2	487	5	1.5:1
1988		470	48	486	29	476	77	1.7:1
1989		475	2	478	3	477	5	0.7:1
1990		547	17	521	7	540	24	2.4:1
1991		517	36	490	17	509	53	2.1:1
1992		473	2	497	3	487	5	0.7:1
1993		484	28	495	13	487	41	2.2:1
1994		458	27	482	9	464	36	3.0:1
1995		485	34	497	16	489	50	2.1:1
1996		477	41	510	19	487	60	2.2:1
1997		463	50	490	18	470	68	2.8:1
1998		473	39	505	18	483	57	2.2:1
1999		468	136	478	59	471	195	2.3:1
2000		464	7	458	2	462	9	3.5:1
2001		462	61	486	29	470	90	2.1:1
2002		471	104	481	39	474	143	2.7:1
2003		474	90	477	65	475	155	1.4:1
2004		460	48	484	21	467	69	2.3:1
2005		457	48	475	27	464	75	1.8:1
2006		475	35	465	34	470	69	1.0:1
2007		464	30	476	8	467	38	3.8:1
2008		444	45	451	12	445	57	3.8:1
2010		480	31	476	16	479	47	1.9:1
Average (1980–2008)		474	43	483	22	477	65	2.0:1
1987	1.3	601	54	573	37	589	91	1.5:1
1988		581	195	550	138	567	333	1.4:1
1989		595	174	562	149	580	323	1.2:1
1990		592	184	571	120	584	304	1.5:1
1991		560	105	543	75	553	180	1.4:1
1992		555	24	535	18	546	42	1.3:1
1993		578	81	559	92	568	173	0.9:1
1994		563	124	547	147	554	271	0.8:1
1995		581	40	555	60	565	100	0.7:1
1996		607	50	585	50	596	100	1.0:1
1997		593	164	565	194	578	358	0.8:1
1998		583	114	556	143	568	257	0.8:1
1999		575	164	545	195	558	359	0.8:1
2000		598	99	565	161	578	260	0.6:1
2001		580	45	561	75	568	120	0.6:1
2002		582	103	563	150	571	253	0.7:1
2003		577	235	558	317	566	552	0.7:1
2004		565	72	544	81	554	153	0.9:1
2005		561	109	541	181	548	290	0.6:1
2006		555	85	533	121	542	206	0.7:1
2007		575	118	546	177	557	295	0.7:1
2008		571	76	548	96	558	172	0.8:1
2010		567	76	542	93	554	169	0.8:1
Average (1980–2008)		579	114	554	132	565	246	0.9:1

-continued-

Table 36.–Page 2 of 2.

Year	Male			Female		Both		Ratio Male: Female
	Age Class	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	Ave Length (mm)	Sample Size	
1987	2.2	489	5	501	3	493	8	1.7:1
1988		487	72	496	60	491	132	1.2:1
1989		526	6	524	8	525	14	0.8:1
1990		519	14	523	6	521	20	2.3:1
1991		515	42	498	18	510	60	2.3:1
1992		486	10	492	14	490	24	0.7:1
1993		479	16	497	11	486	27	1.5:1
1994		466	54	481	13	469	67	4.2:1
1995		503	40	513	11	505	51	3.6:1
1996		497	65	525	29	506	94	2.2:1
1997	473	30	519	12	486	42	2.5:1	
1998	497	27	515	31	507	58	0.9:1	
1999	474	57	497	27	481	84	2.1:1	
2000	452	6	495	2	463	8	3.0:1	
2001	481	87	494	43	485	130	2.0:1	
2002	492	48	506	36	498	84	1.3:1	
2003	498	81	496	64	497	145	1.3:1	
2004	480	47	482	31	481	78	1.5:1	
2005	491	28	489	21	490	49	1.3:1	
2006	472	21	472	13	472	34	1.6:1	
2007	444	12	489	4	455	16	3.0:1	
2008	476	22	489	10	480	32	2.2:1	
2010	498	31	500	37	499	68	0.8:1	
Average (1981–2010)		489	41	500	28	493	69	1.5:1
1987	2.3	594	49	573	37	585	86	1.3:1
1988		585	110	556	83	572	193	1.3:1
1989		591	222	564	142	580	364	1.6:1
1990		601	165	573	72	593	237	2.3:1
1991		558	36	537	23	550	59	1.6:1
1992		572	58	547	62	559	120	0.9:1
1993		585	104	558	114	571	218	0.9:1
1994		570	86	549	81	560	167	1.1:1
1995		581	154	553	181	566	335	0.9:1
1996		604	66	577	71	590	137	0.9:1
1997	590	84	569	86	579	170	1.0:1	
1998	584	85	563	118	572	203	0.7:1	
1999	575	138	545	129	561	267	1.1:1	
2000	599	20	566	60	574	80	0.3:1	
2001	578	91	559	131	567	222	0.7:1	
2002	589	108	563	158	574	266	0.7:1	
2003	579	96	559	123	568	219	0.8:1	
2004	569	84	545	102	556	186	0.8:1	
2005	557	61	541	84	548	145	0.7:1	
2006	559	81	555	94	556	175	0.9:1	
2007	561	44	549	53	554	97	0.8:1	
2008	563	21	545	29	553	50	0.7:1	
2010	574	65	550	99	559	164	0.7:1	
Average (1981–2008)		581	95	556	102	568	197	0.9:1
2010 summary (all ages)		545	204	534	247	539	451	0.8:1

Note: Data available back to 1980, no data available for 2009.

## **FIGURES**

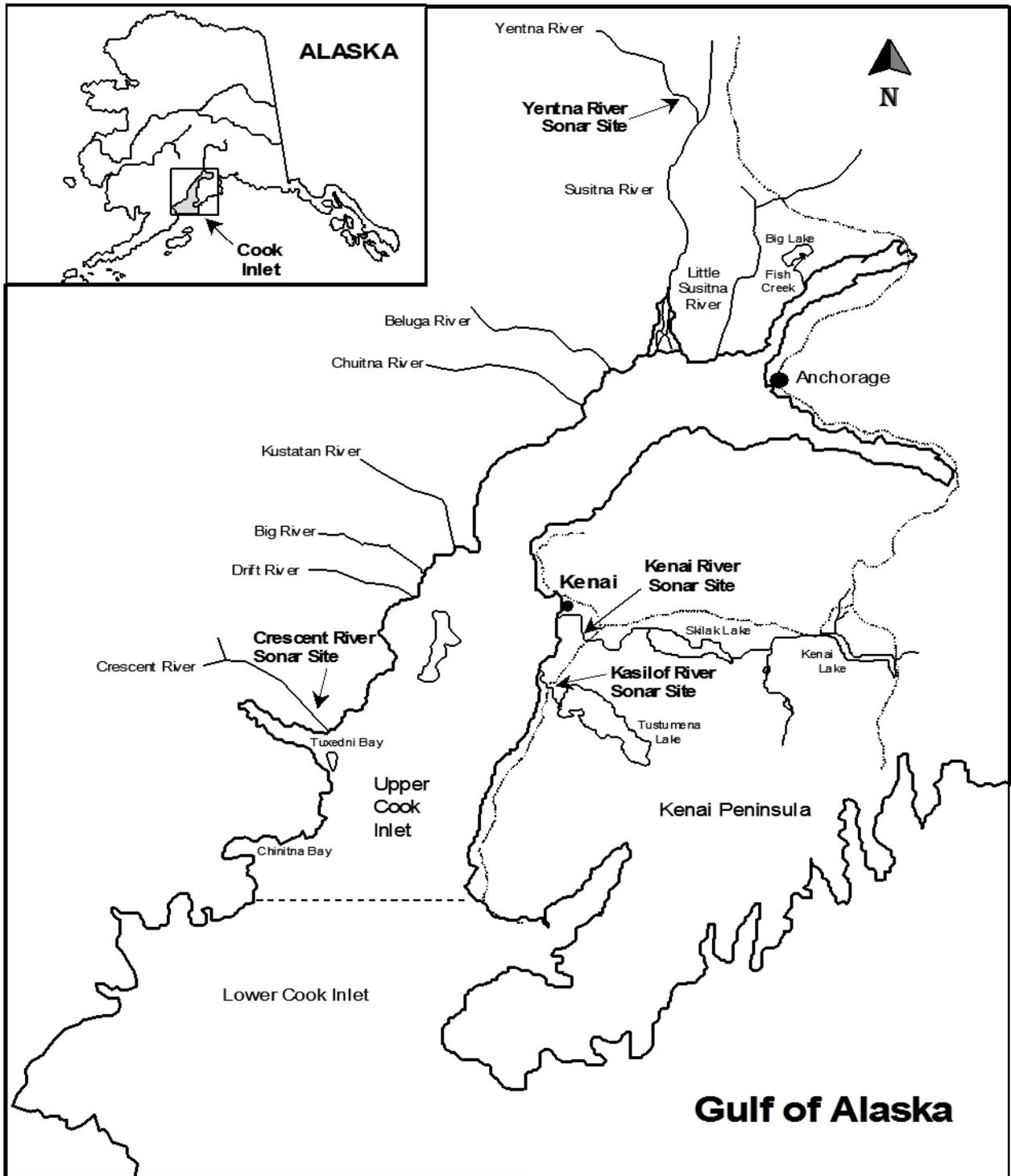


Figure 1.—A map of Upper Cook Inlet, Alaska, showing sites where salmon sonar enumeration projects are conducted.

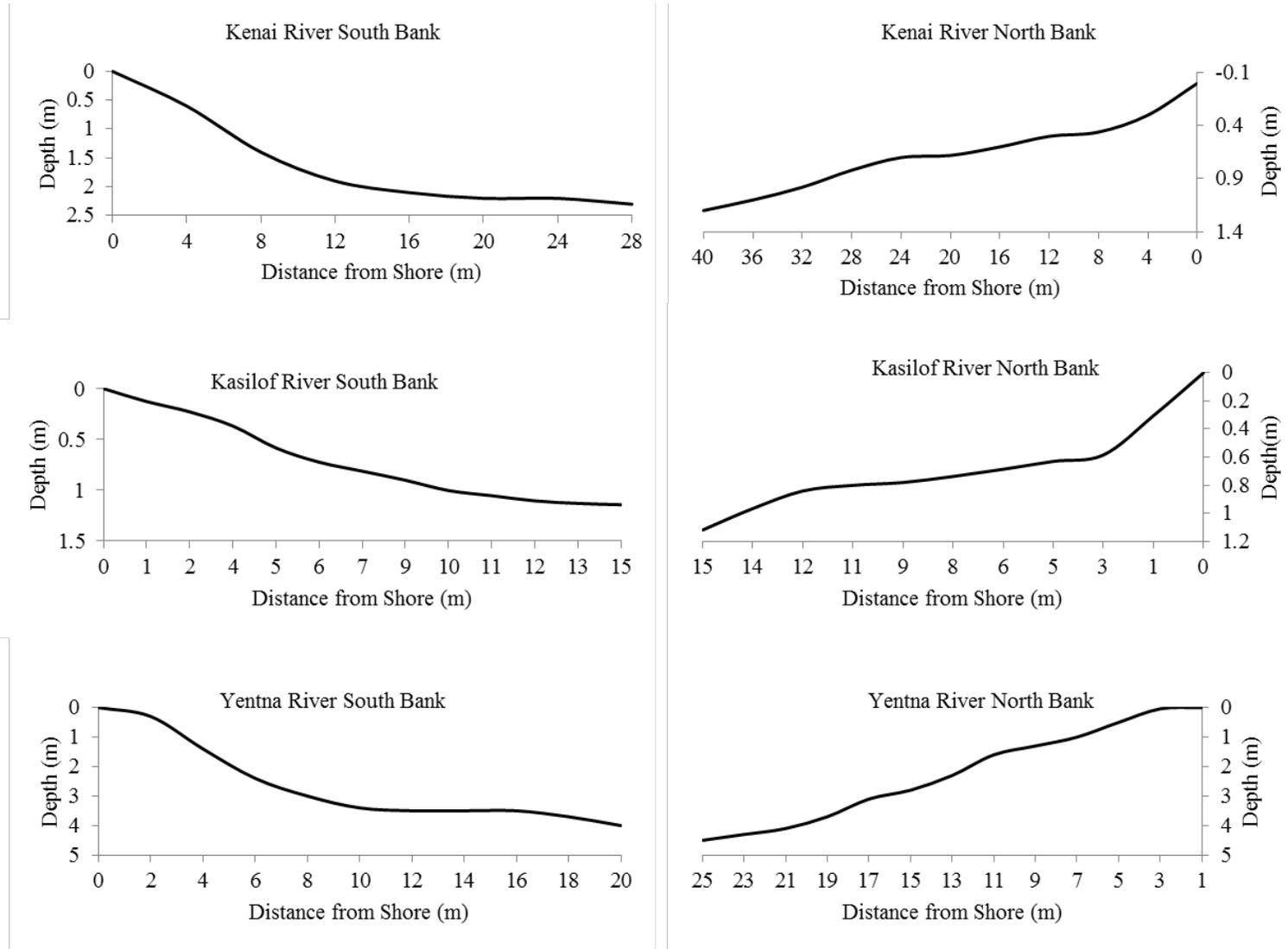


Figure 2.—Sonar site river profiles of the Kenai (top), Kasilof (middle) and Yentna rivers (bottom).

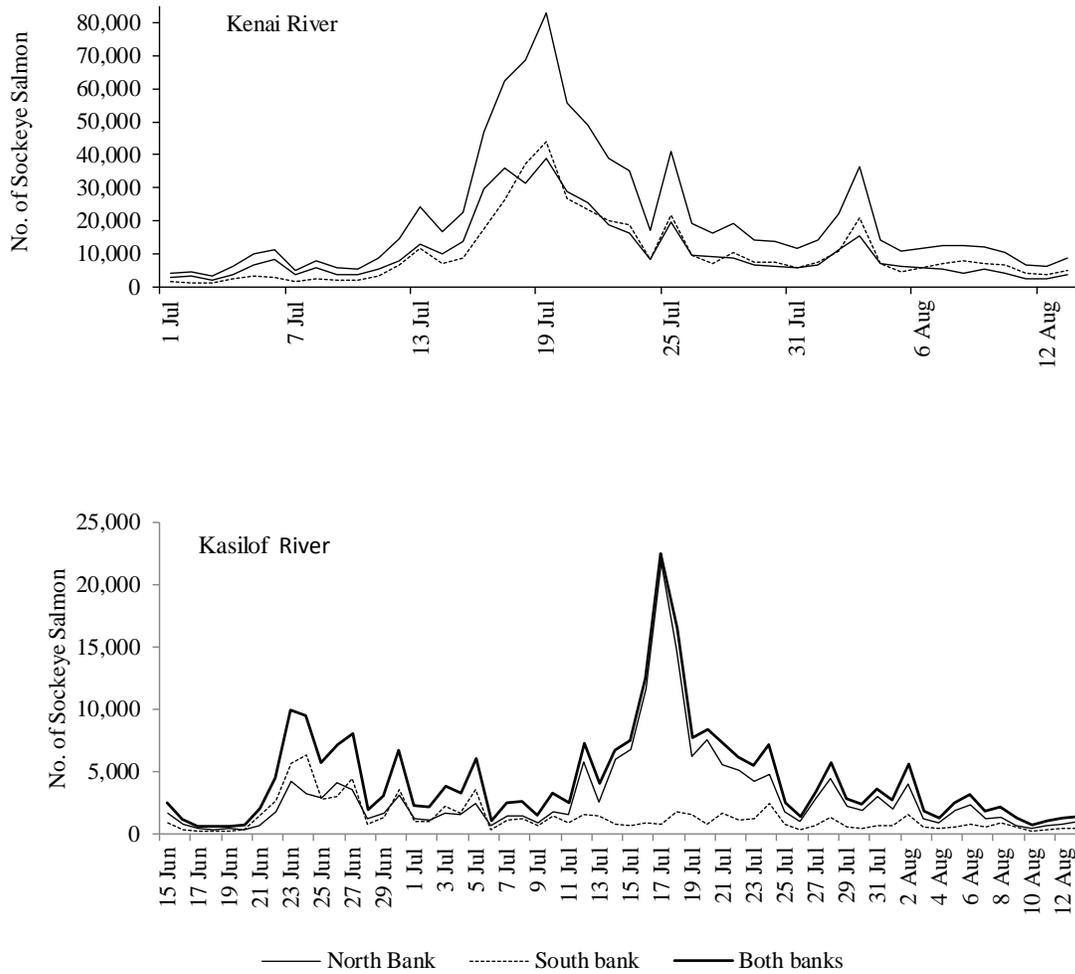


Figure 3.—Total daily sonar counts by bank for sockeye salmon passage into the Kenai and Kasilof rivers, 2010.

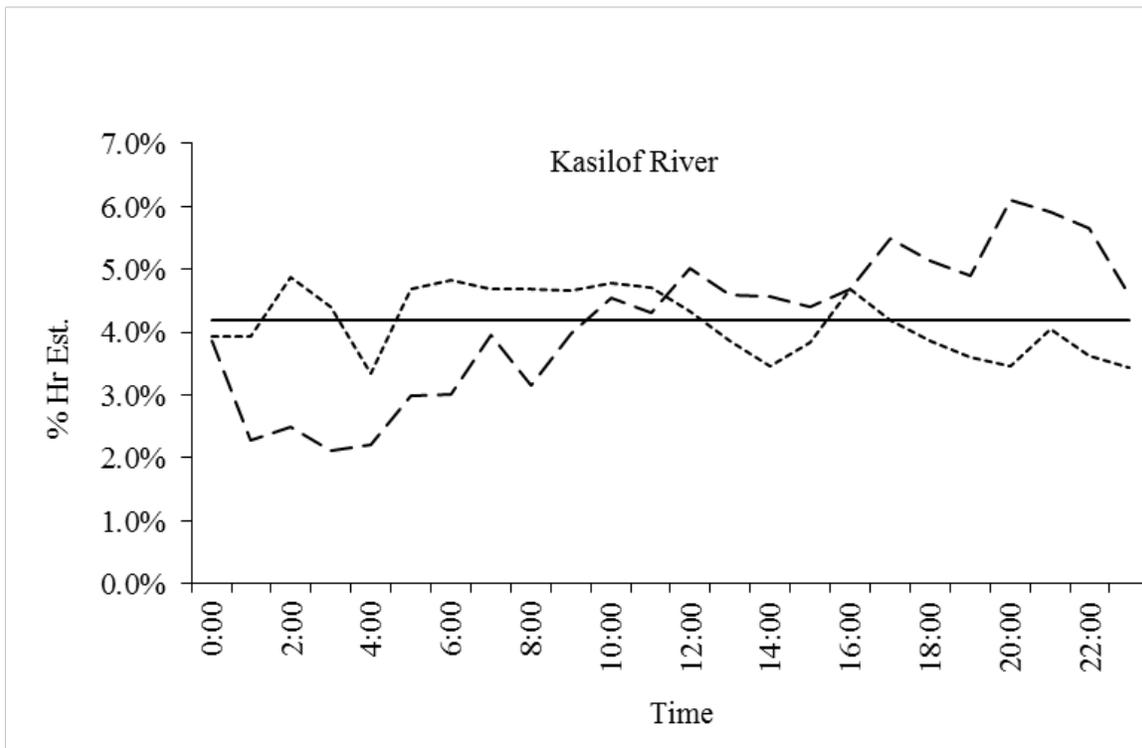
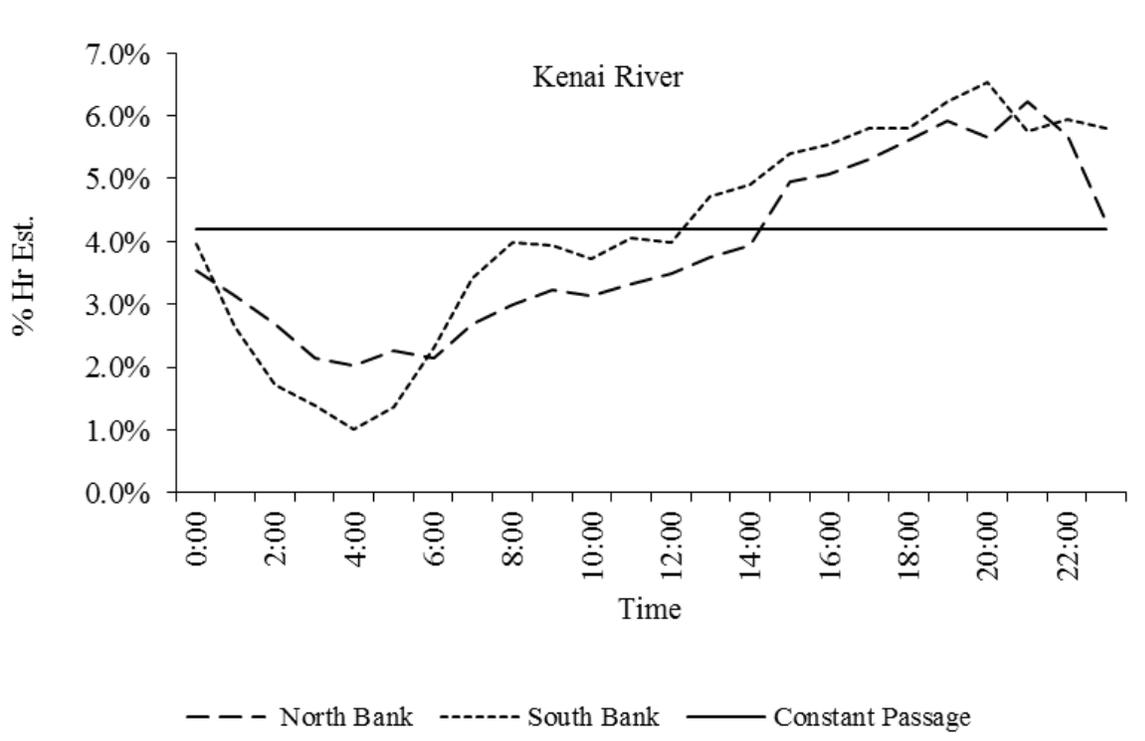
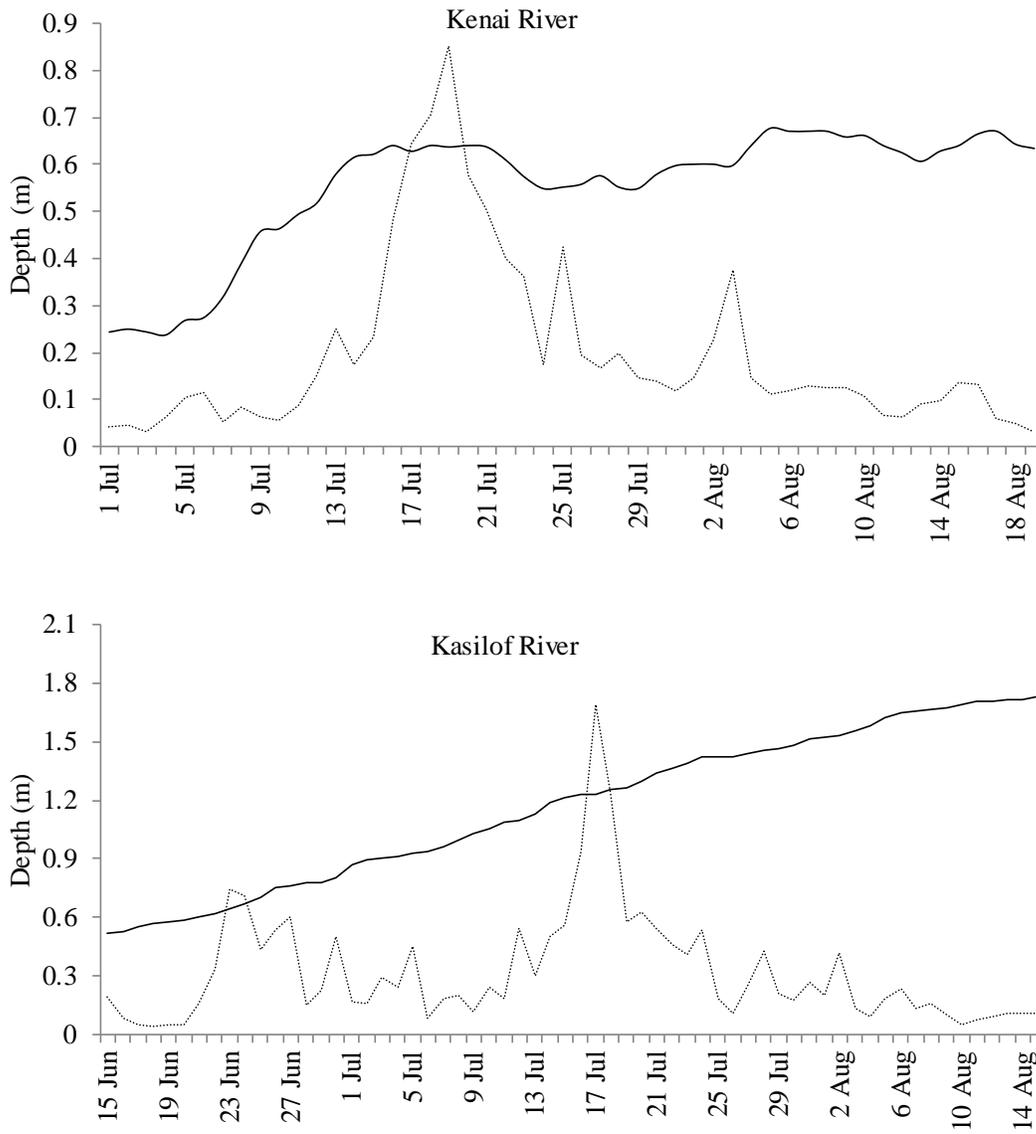
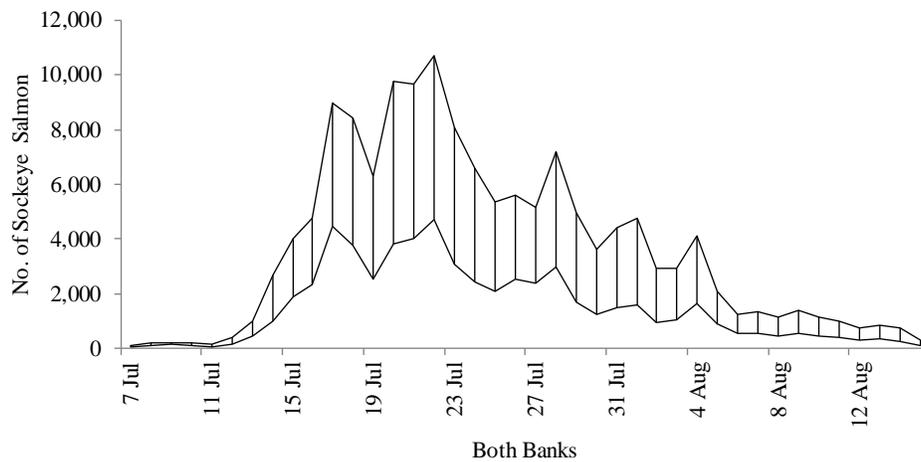
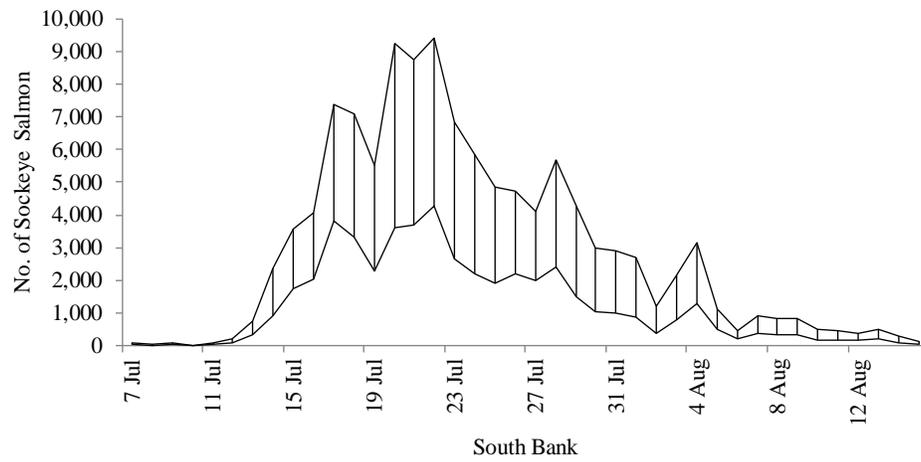
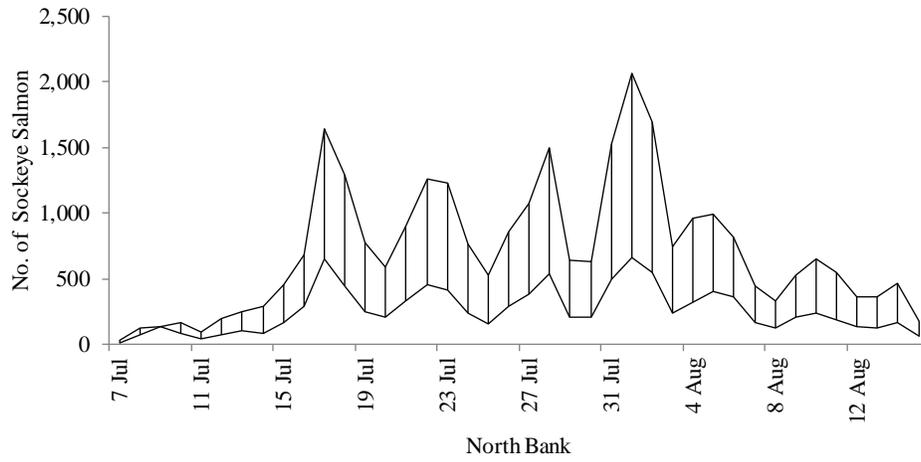


Figure 4.—Mean hourly salmon migration rates by bank in the Kenai (top), and Kasilof (bottom, 2010) rivers.



*Note:* Daily run timing for sockeye salmon (dotted line) is interposed.

Figure 5.—Daily water level fluctuations (solid line) for the Kenai (top), and Kasilof (bottom) rivers, 2010.



*Note:* The top line represents a maximum migration estimate and the bottom line represents minimum.

Figure 6.—The daily ranges in migratory timing of sockeye salmon in the Yentna River, 2010.

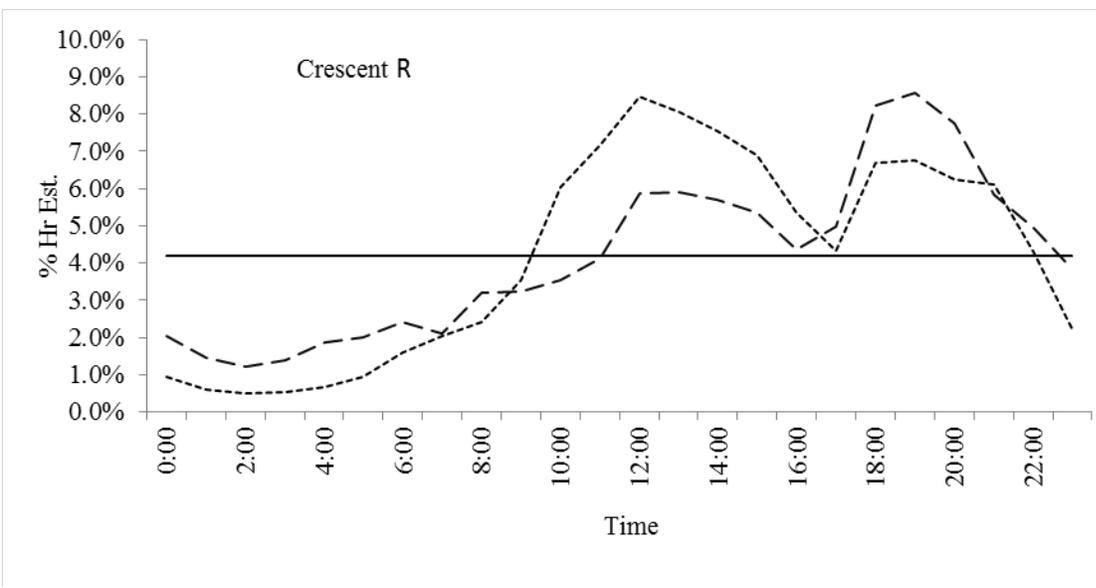
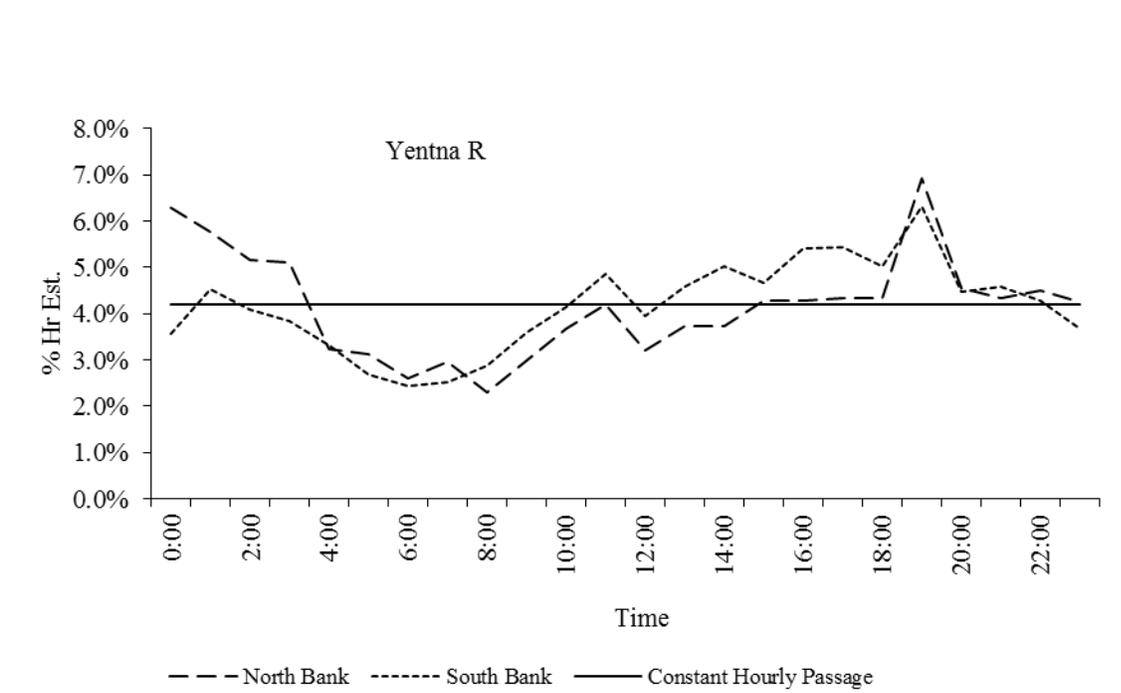
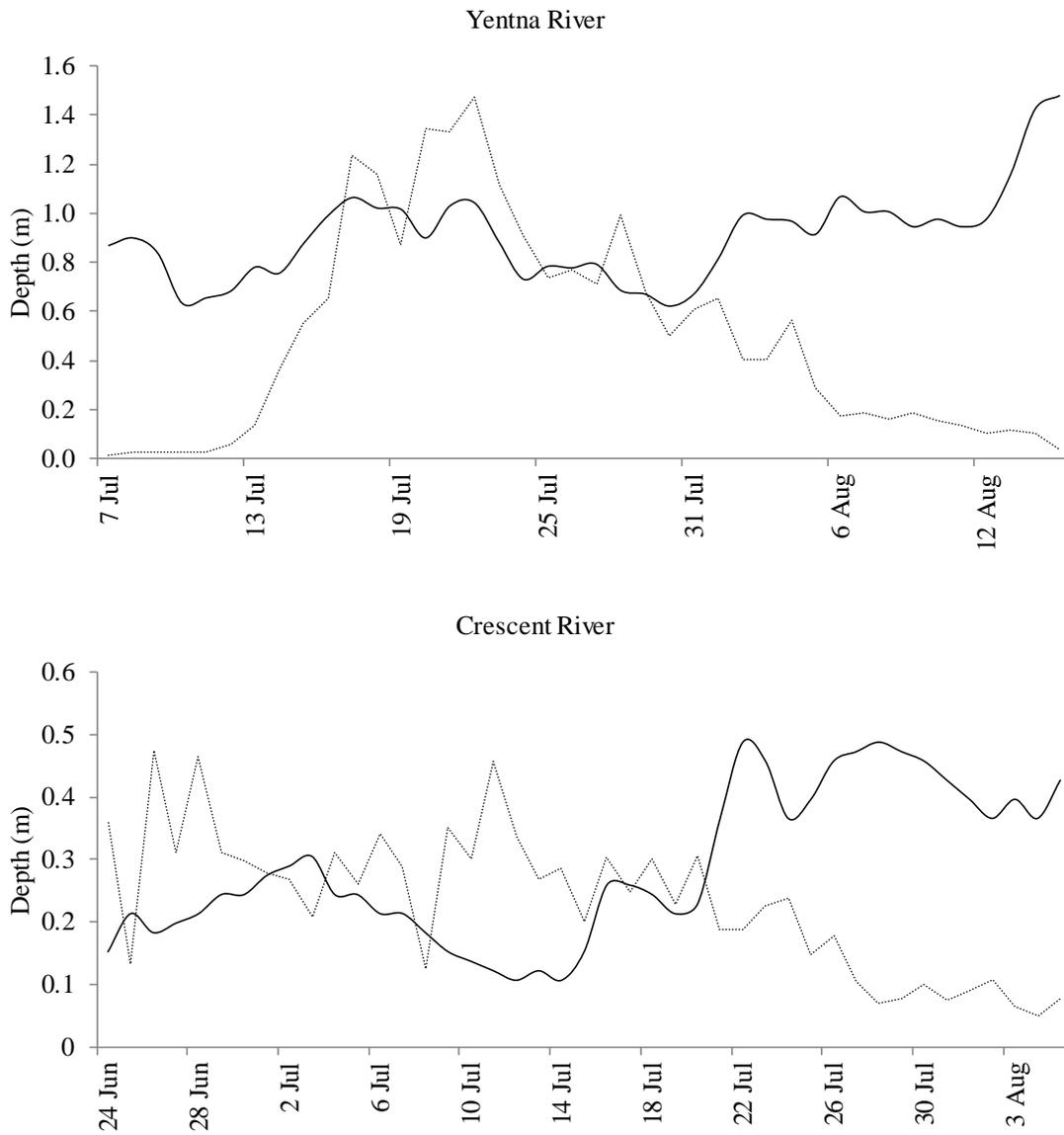


Figure 7.—Mean hourly salmon passage rates by bank in the Yentna (top), and Crescent (bottom, 2010) rivers.



Note: Daily sockeye salmon run timing is interposed (dotted line).

Figure 8.—Daily water level fluctuations for the Yentna (top) and Crescent rivers (bottom), 2010.

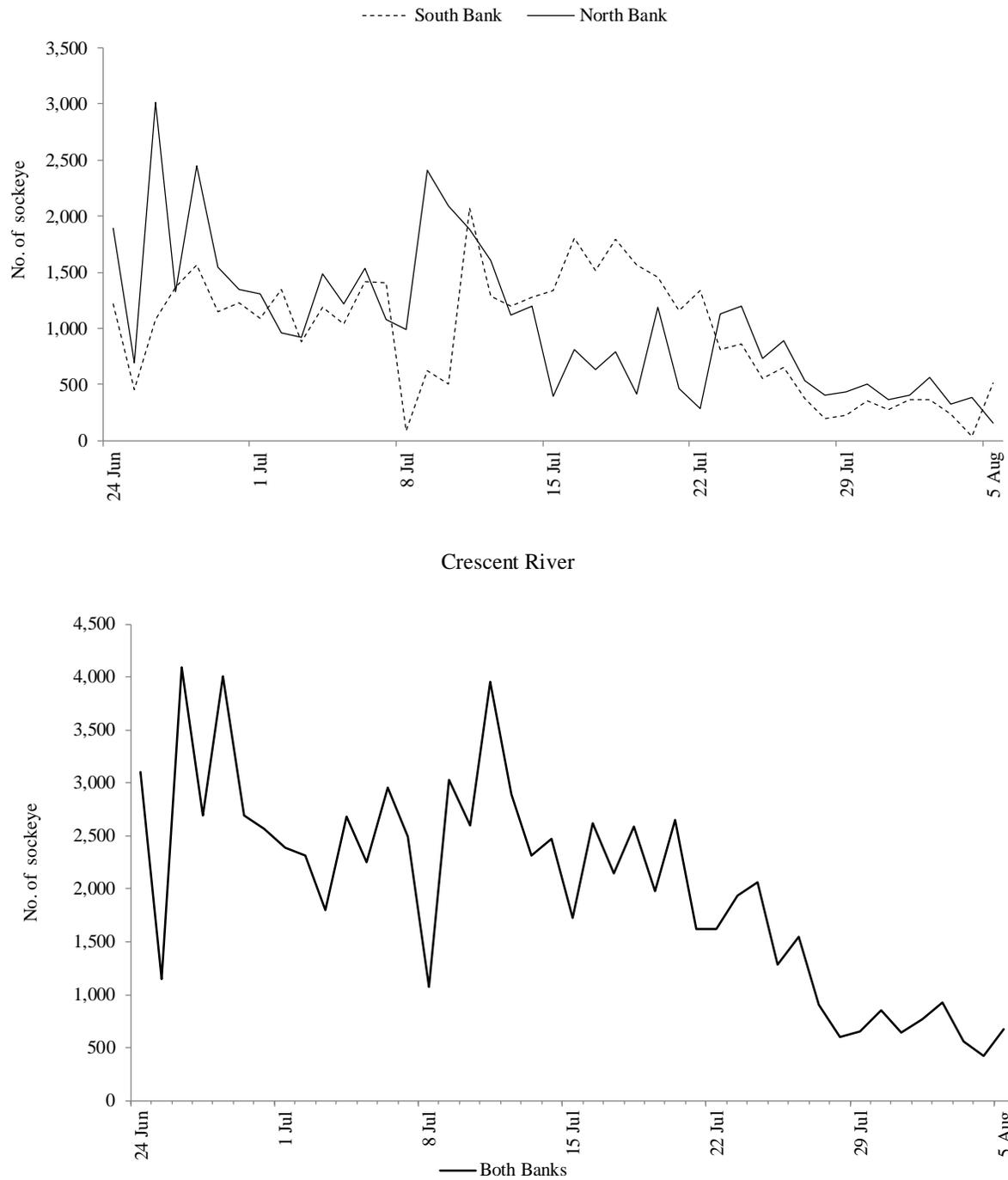


Figure 9.—Daily run timing of sockeye salmon by bank (top) and total (bottom) in the Crescent River, 2010.

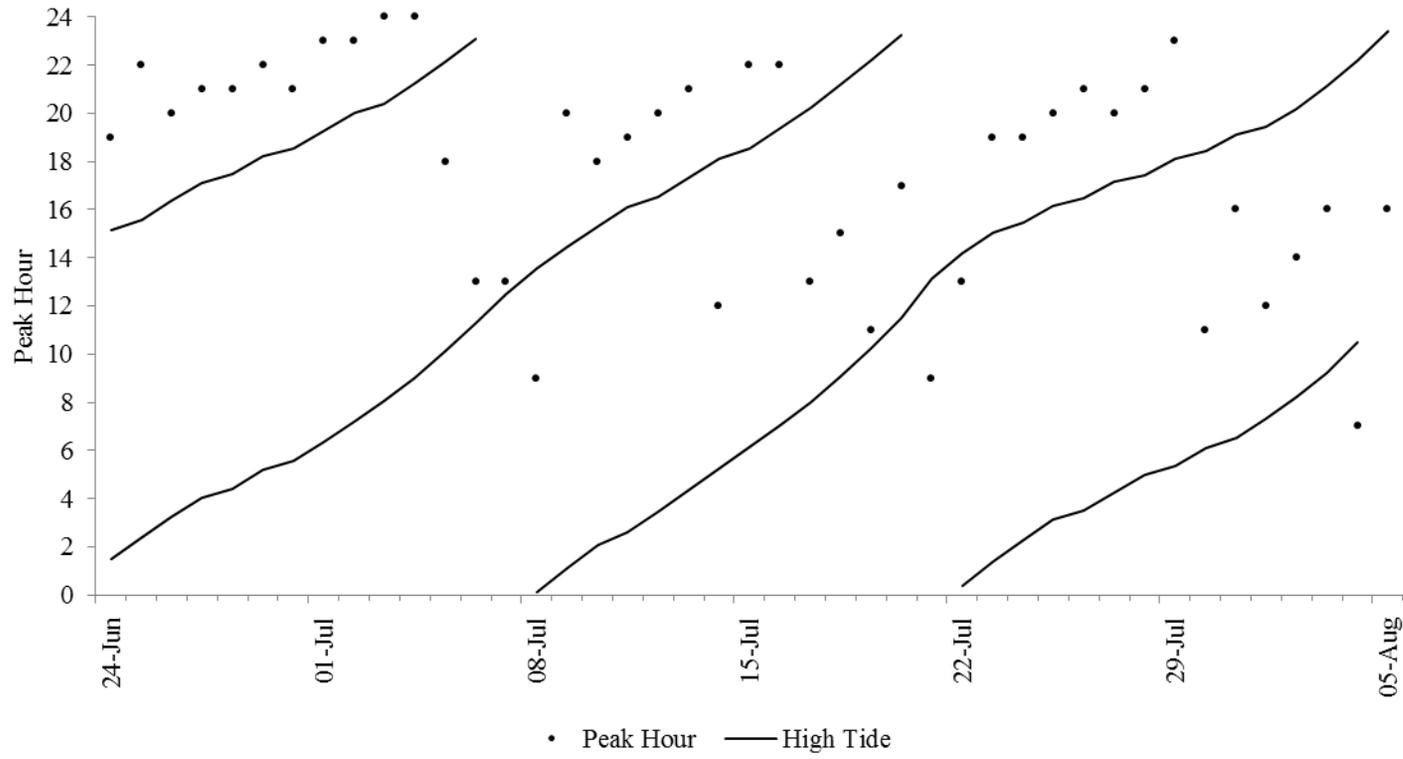


Figure 10.—The relationship between run timing (peak hourly counts) and time of high tide on the sockeye salmon run into the Crescent River, 2010.



## **APPENDIX A: KENAI RIVER DATA**

Appendix A1.—Salmon migration estimates along the north bank, Kenai River, 2010.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	2,810	2,810	0	0	0	0	0	0
2 Jul	3,397	6,207	0	0	0	0	0	0
3 Jul	2,207	8,414	0	0	0	0	0	0
4 Jul	3,759	12,173	0	0	0	0	0	0
5 Jul	6,731	18,904	0	0	0	0	0	0
6 Jul	8,177	27,081	0	0	0	0	0	0
7 Jul	3,502	30,583	0	0	0	0	0	0
8 Jul	5,712	36,296	0	0	0	0	0	0
9 Jul	3,856	40,152	0	0	0	0	0	0
10 Jul	3,602	43,754	0	0	0	0	0	0
11 Jul	5,381	49,135	0	0	0	0	0	0
12 Jul	7,978	57,113	0	0	0	0	0	0
13 Jul	12,910	70,023	0	0	0	0	0	0
14 Jul	9,921	79,943	0	0	0	0	0	0
15 Jul	13,804	93,747	0	0	0	0	0	0
16 Jul	29,550	123,297	0	0	0	0	0	0
17 Jul	36,096	159,393	0	0	0	0	0	0
18 Jul	31,501	190,894	0	0	0	0	0	0
19 Jul	39,039	229,933	0	0	0	0	0	0
20 Jul	28,937	258,870	0	0	0	0	0	0
21 Jul	25,309	284,179	0	0	0	0	0	0
22 Jul	18,690	302,869	0	0	0	0	0	0
23 Jul	16,121	318,990	0	0	0	0	0	0
24 Jul	8,495	327,485	0	0	0	0	0	0
25 Jul	19,532	347,017	0	0	0	0	0	0
26 Jul	9,588	356,605	0	0	0	0	0	0
27 Jul	9,295	365,900	0	0	0	0	0	0
28 Jul	8,940	374,839	0	0	0	0	0	0
29 Jul	6,824	381,663	0	0	0	0	0	0
30 Jul	6,142	387,805	0	0	0	0	0	0
31 Jul	5,780	393,586	0	0	0	0	0	0
1 Aug	6,691	400,276	0	0	0	0	0	0
2 Aug	11,395	411,671	0	0	0	0	0	0
3 Aug	15,512	427,183	0	0	0	0	0	0
4 Aug	6,966	434,149	0	0	0	0	0	0
5 Aug	6,034	440,183	0	0	0	0	0	0
6 Aug	5,824	446,006	0	0	0	0	0	0
7 Aug	5,361	451,368	357	357	0	0	0	0
8 Aug	4,267	455,635	0	357	0	0	178	178
9 Aug	5,188	460,823	167	525	84	84	167	345
10 Aug	4,036	464,858	221	746	55	139	0	345
11 Aug	2,522	467,381	467	1,213	93	232	47	392
12 Aug	2,430	469,810	437	1,650	0	232	146	538
13 Aug	3,827	473,637	195	1,845	32	265	0	538
14 Aug	4,093	477,730	719	2,564	0	265	332	870
15 Aug	5,676	483,406	541	3,105	135	400	0	870
16 Aug	5,329	488,735	796	3,901	122	522	61	931
17 Aug	2,598	491,333	1,500	5,401	915	1,437	73	1,004
18 Aug	1,911	493,244	1,092	6,493	637	2,074	273	1,277
19 Aug	1,106	494,350	1,106	7,599	1,014	3,088	184	1,461
	Per cent	97.6		1.5		0.6		0.3
	Total	506,499						

Note: Numbers are Bendix equivalents without a sport fishery allocation deduction.

Appendix A2.—Estimated salmon passage along the south bank, Kenai River, 2010.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	1,480	1,480	0	0	0	0	0	0
2 Jul	1,160	2,640	0	0	0	0	0	0
3 Jul	1,034	3,674	0	0	0	0	0	0
4 Jul	2,333	6,006	0	0	0	0	0	0
5 Jul	3,478	9,484	0	0	0	0	0	0
6 Jul	3,055	12,539	0	0	0	0	0	0
7 Jul	1,511	14,051	0	0	0	0	0	0
8 Jul	2,385	16,435	0	0	0	0	0	0
9 Jul	2,122	18,558	0	0	0	0	0	0
10 Jul	1,942	20,499	0	0	0	0	0	0
11 Jul	3,167	23,667	0	0	0	0	0	0
12 Jul	6,456	30,123	0	0	0	0	0	0
13 Jul	11,502	41,625	0	0	0	0	0	0
14 Jul	6,983	48,608	0	0	0	0	0	0
15 Jul	8,848	57,456	0	0	0	0	0	0
16 Jul	17,466	74,922	0	0	0	0	0	0
17 Jul	26,220	101,142	0	0	0	0	0	0
18 Jul	37,052	138,194	0	0	0	0	0	0
19 Jul	43,765	181,960	0	0	0	0	0	0
20 Jul	26,946	208,906	0	0	0	0	0	0
21 Jul	23,531	232,437	0	0	0	0	0	0
22 Jul	20,067	252,504	0	0	0	0	0	0
23 Jul	19,002	271,506	0	0	0	0	0	0
24 Jul	8,478	279,984	0	0	0	0	0	0
25 Jul	21,557	301,542	0	0	0	0	0	0
26 Jul	9,443	310,985	0	0	0	0	0	0
27 Jul	7,021	318,005	0	0	0	0	0	0
28 Jul	10,383	328,389	0	0	0	0	0	0
29 Jul	7,404	335,792	0	0	0	0	0	0
30 Jul	7,557	343,349	0	0	0	0	0	0
31 Jul	5,745	349,094	0	0	0	0	0	0
1 Aug	7,623	356,718	0	0	0	0	0	0
2 Aug	10,744	367,462	0	0	0	0	0	0
3 Aug	20,805	388,267	0	0	0	0	0	0
4 Aug	7,174	395,441	0	0	0	0	0	0
5 Aug	4,715	400,156	0	0	0	0	0	0
6 Aug	5,736	405,892	0	0	0	0	0	0
7 Aug	7,107	412,998	474	474	0	0	0	0
8 Aug	8,043	421,041	0	474	0	0	335	335
9 Aug	6,873	427,914	222	695	111	111	222	557
10 Aug	6,535	434,449	358	1,054	90	200	0	557
11 Aug	4,119	438,568	763	1,816	153	353	76	633
12 Aug	3,721	442,289	670	2,486	0	353	223	856
13 Aug	5,033	447,322	256	2,742	43	396	0	856
14 Aug	5,495	452,817	965	3,707	0	396	446	1,302
15 Aug	7,606	460,423	724	4,432	181	577	0	1,302
16 Aug	7,487	467,911	1,119	5,551	172	749	86	1,388
17 Aug	3,244	471,154	1,873	7,424	1,142	1,891	91	1,479
18 Aug	3,040	474,195	1,737	9,161	1,013	2,904	434	1,914
19 Aug	2,117	476,312	2,117	11,278	1,941	4,845	353	2,267
Proportion		96.3		2.3		1.0		0.5
Total estimate		494,701						

Note: Numbers are Bendix equivalents without a sport fishery allocation deduction.

Appendix A3.—DIDSON estimates and Bendix equivalents including the sport fish allocation (17.6%) for the north bank, Kenai River, 2010.

Date	Bank: North									
	DIDSON Estimate		DIDSON x 17.6%			Bendix Equivalent		17.6% + Bendix		
	Daily	Cum	Daily	Cum	dif.	Daily	Cum	Daily	Cum	
1 Jul	3,510	3,510	618	618	2,892	2,192	2,192	2,810	2,810	
2 Jul	4,344	7,854	765	1,382	3,579	2,632	4,824	3,397	6,207	
3 Jul	2,664	10,518	469	1,851	2,195	1,738	6,562	2,207	8,414	
4 Jul	4,864	15,382	856	2,707	4,008	2,903	9,465	3,759	12,173	
5 Jul	9,204	24,586	1,620	4,327	7,584	5,111	14,577	6,731	18,904	
6 Jul	11,348	35,934	1,997	6,324	9,351	6,180	20,757	8,177	27,081	
7 Jul	4,495	40,429	791	7,116	3,704	2,711	23,468	3,502	30,583	
8 Jul	7,704	48,133	1,356	8,471	6,348	4,356	27,824	5,712	36,296	
9 Jul	5,004	53,137	881	9,352	4,123	2,976	30,800	3,856	40,152	
10 Jul	4,638	57,775	816	10,168	3,822	2,785	33,586	3,602	43,754	
11 Jul	7,218	64,993	1,270	11,439	5,948	4,110	37,696	5,381	49,135	
12 Jul	11,052	76,045	1,945	13,384	9,107	6,033	43,729	7,978	57,113	
13 Jul	18,444	94,489	3,246	16,630	15,198	9,664	53,393	12,910	70,023	
14 Jul	13,950	108,439	2,455	19,085	11,495	7,465	60,858	9,921	79,943	
15 Jul	19,794	128,233	3,484	22,569	16,310	10,320	71,178	13,804	93,747	
16 Jul	43,836	172,069	7,715	30,284	36,121	21,835	93,013	29,550	123,297	
17 Jul	53,916	225,985	9,489	39,773	44,427	26,607	119,620	36,096	159,393	
18 Jul	46,836	272,821	8,243	48,016	38,593	23,258	142,877	31,501	190,894	
19 Jul	58,458	331,279	10,289	58,305	48,169	28,750	171,628	39,039	229,933	
20 Jul	42,894	374,173	7,549	65,854	35,345	21,388	193,016	28,937	258,870	
21 Jul	37,326	411,499	6,569	72,424	30,757	18,740	211,755	25,309	284,179	
22 Jul	27,211	438,710	4,789	77,213	22,422	13,901	225,656	18,690	302,869	
23 Jul	23,304	462,014	4,102	81,314	19,202	12,019	237,676	16,121	318,990	
24 Jul	11,820	473,834	2,080	83,395	9,740	6,414	244,090	8,495	327,485	
25 Jul	28,494	502,328	5,015	88,410	23,479	14,517	258,607	19,532	347,017	
26 Jul	13,452	515,780	2,368	90,777	11,084	7,220	265,827	9,588	356,605	
27 Jul	14,574	530,354	0	90,777	14,574	9,295	275,122	9,295	365,900	
28 Jul	13,974	544,328	0	90,777	13,974	8,940	284,062	8,940	374,839	
29 Jul	10,422	554,750	0	90,777	10,422	6,824	290,886	6,824	381,663	
30 Jul	9,288	564,038	0	90,777	9,288	6,142	297,028	6,142	387,805	
31 Jul	8,688	572,726	0	90,777	8,688	5,780	302,808	5,780	393,586	
1 Aug	10,200	582,926	0	90,777	10,200	6,691	309,499	6,691	400,276	
2 Aug	18,138	601,064	0	90,777	18,138	11,395	320,894	11,395	411,671	
3 Aug	25,188	626,252	0	90,777	25,188	15,512	336,406	15,512	427,183	
4 Aug	10,659	636,911	0	90,777	10,659	6,966	343,371	6,966	434,149	
5 Aug	9,108	646,019	0	90,777	9,108	6,034	349,405	6,034	440,183	
6 Aug	8,760	654,779	0	90,777	8,760	5,824	355,229	5,824	446,006	
7 Aug	8,586	663,365	0	90,777	8,586	5,719	360,948	5,719	451,725	
8 Aug	6,492	669,857	0	90,777	6,492	4,445	365,393	4,445	456,170	
9 Aug	8,400	678,257	0	90,777	8,400	5,606	370,999	5,606	461,776	
10 Aug	6,276	684,533	0	90,777	6,276	4,312	375,311	4,312	466,089	
11 Aug	4,368	688,901	0	90,777	4,368	3,129	378,441	3,129	469,218	
12 Aug	4,182	693,083	0	90,777	4,182	3,013	381,453	3,013	472,231	
13 Aug	5,856	698,939	0	90,777	5,856	4,054	385,507	4,054	476,284	
14 Aug	7,638	706,577	0	90,777	7,638	5,144	390,651	5,144	481,429	
15 Aug	9,636	716,213	0	90,777	9,636	6,352	397,003	6,352	487,780	
16 Aug	9,564	725,777	0	90,777	9,564	6,309	403,312	6,309	494,089	
17 Aug	7,542	733,319	0	90,777	7,542	5,086	408,398	5,086	499,175	
18 Aug	5,628	738,947	0	90,777	5,628	3,913	412,311	3,913	503,088	
19 Aug	4,818	743,765	0	90,777	4,818	3,411	415,721	3,411	506,499	

Note: Estimates are not apportioned to species.

Appendix A4.–DIDSON estimates and Bendix equivalents including the sport fish allocation (17.6%) for the south bank, Kenai River, 2010.

Date	Bank: South								
	DIDSON Estimate		DIDSON x 17.6%			Bendix equivalent		17.6% + Bendix	
	Daily	Cum	Daily	Cum	dif.	Daily	Cum	Daily	Cum
1 Jul	1,584	1,584	279	279	1,305	1,201	1,201	1,480	1,480
2 Jul	1,218	2,802	214	493	1,004	946	2,147	1,160	2,640
3 Jul	1,074	3,876	189	682	885	844	2,991	1,034	3,674
4 Jul	2,573	6,449	453	1,135	2,120	1,880	4,871	2,333	6,006
5 Jul	3,918	10,367	690	1,825	3,228	2,789	7,660	3,478	9,484
6 Jul	3,420	13,787	602	2,427	2,818	2,453	10,113	3,055	12,539
7 Jul	1,620	15,407	285	2,712	1,335	1,226	11,339	1,511	14,051
8 Jul	2,634	18,041	464	3,175	2,170	1,921	13,260	2,385	16,435
9 Jul	2,328	20,369	410	3,585	1,918	1,713	14,973	2,122	18,558
10 Jul	2,118	22,487	373	3,958	1,745	1,569	16,542	1,942	20,499
11 Jul	3,552	26,039	625	4,583	2,927	2,542	19,084	3,167	23,667
12 Jul	7,456	33,495	1,312	5,895	6,144	5,144	24,228	6,456	30,123
13 Jul	13,511	47,006	2,378	8,273	11,133	9,124	33,352	11,502	41,625
14 Jul	8,085	55,091	1,423	9,696	6,662	5,560	38,912	6,983	48,608
15 Jul	10,320	65,411	1,816	11,512	8,504	7,032	45,943	8,848	57,456
16 Jul	20,712	86,123	3,645	15,158	17,067	13,821	59,764	17,466	74,922
17 Jul	31,326	117,449	5,513	20,671	25,813	20,706	80,471	26,220	101,142
18 Jul	44,501	161,950	7,832	28,503	36,669	29,220	109,691	37,052	138,194
19 Jul	52,680	214,630	9,272	37,775	43,408	34,494	144,185	43,765	181,960
20 Jul	32,208	246,838	5,669	43,443	26,539	21,277	165,462	26,946	208,906
21 Jul	28,062	274,900	4,939	48,382	23,123	18,592	184,054	23,531	232,437
22 Jul	23,862	298,762	4,200	52,582	19,662	15,868	199,922	20,067	252,504
23 Jul	22,572	321,334	3,973	56,555	18,599	15,030	214,952	19,002	271,506
24 Jul	9,876	331,210	1,738	58,293	8,138	6,740	221,692	8,478	279,984
25 Jul	25,668	356,878	4,518	62,811	21,150	17,040	238,731	21,557	301,542
26 Jul	11,034	367,912	1,942	64,753	9,092	7,501	246,232	9,443	310,985
27 Jul	8,490	376,402	0	64,753	8,490	7,021	253,253	7,021	318,005
28 Jul	12,720	389,122	0	64,753	12,720	10,383	263,636	10,383	328,389
29 Jul	8,970	398,092	0	64,753	8,970	7,404	271,040	7,404	335,792
30 Jul	9,162	407,254	0	64,753	9,162	7,557	278,596	7,557	343,349
31 Jul	6,894	414,148	0	64,753	6,894	5,745	284,342	5,745	349,094
1 Aug	9,246	423,394	0	64,753	9,246	7,623	291,965	7,623	356,718
2 Aug	13,176	436,570	0	64,753	13,176	10,744	302,709	10,744	367,462
3 Aug	25,938	462,508	0	64,753	25,938	20,805	323,514	20,805	388,267
4 Aug	8,682	471,190	0	64,753	8,682	7,174	330,688	7,174	395,441
5 Aug	5,610	476,800	0	64,753	5,610	4,715	335,403	4,715	400,156
6 Aug	6,882	483,682	0	64,753	6,882	5,736	341,139	5,736	405,892
7 Aug	9,192	492,874	0	64,753	9,192	7,580	348,720	7,580	413,472
8 Aug	10,194	503,068	0	64,753	10,194	8,378	357,098	8,378	421,850
9 Aug	9,000	512,068	0	64,753	9,000	7,427	364,525	7,427	429,278
10 Aug	8,442	520,510	0	64,753	8,442	6,983	371,508	6,983	436,260
11 Aug	6,102	526,612	0	64,753	6,102	5,110	376,618	5,110	441,371
12 Aug	5,484	532,096	0	64,753	5,484	4,614	381,232	4,614	445,984
13 Aug	6,378	538,474	0	64,753	6,378	5,332	386,564	5,332	451,316
14 Aug	8,346	546,820	0	64,753	8,346	6,906	393,470	6,906	458,222
15 Aug	10,362	557,182	0	64,753	10,362	8,512	401,981	8,512	466,734
16 Aug	10,806	567,988	0	64,753	10,806	8,864	410,845	8,864	475,598
17 Aug	7,650	575,638	0	64,753	7,650	6,350	417,196	6,350	481,948
18 Aug	7,494	583,132	0	64,753	7,494	6,225	423,421	6,225	488,174
19 Aug	7,872	591,004	0	64,753	7,872	6,528	429,949	6,528	494,701

Both banks = 1,334,769

Note: Estimates are not apportioned to species.

Appendix A5.–Kenai River north bank DIDSON estimates (all species) by hour, 2010.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Jul	36	24	0	6	120	54	102	102	510	216	246	198
2 Jul	126	120	48	24	36	144	198	156	246	246	312	306
3 Jul	84	36	60	30	24	90	78	126	132	84	72	132
4 Jul	54	42	24	12	96	96	162	210	318	90	120	66
5 Jul	72	84	60	66	78	96	114	138	342	198	132	138
6 Jul	522	474	156	216	432	600	504	810	606	756	714	930
7 Jul	78	54	18	24	66	42	114	74	78	129	168	208
8 Jul	570	144	198	84	84	324	174	222	222	690	786	600
9 Jul	372	240	162	150	180	186	342	360	252	252	228	486
10 Jul	120	150	120	90	138	126	48	78	156	126	102	270
11 Jul	216	114	150	108	72	120	54	114	246	240	414	594
12 Jul	360	210	270	210	156	492	288	516	162	486	156	270
13 Jul	804	738	894	456	660	426	468	546	846	582	384	582
14 Jul	846	846	732	660	204	198	186	348	288	210	108	318
15 Jul	1,332	1,968	1,446	870	798	348	306	444	294	108	162	216
16 Jul	774	1,272	882	1,800	2,766	1,986	672	882	894	1,722	1,470	1,812
17 Jul	1,488	894	1,728	1,728	1,326	1,866	1,134	1,572	1,002	1,188	1,770	1,950
18 Jul	1,650	624	1,872	888	624	660	1,530	570	630	1,272	942	1,392
19 Jul	3,036	2,322	2,088	2,460	1,902	1,614	1,116	1,218	786	1,710	1,524	1,920
20 Jul	2,124	1,476	828	714	318	552	1,122	2,178	1,284	1,410	1,158	1,920
21 Jul	522	1,122	786	390	714	582	276	798	900	594	1,548	780
22 Jul	930	546	828	360	618	462	570	1,872	2,064	2,166	1,686	1,615
23 Jul	1,278	954	612	276	348	486	504	738	648	786	600	876
24 Jul	888	438	486	174	228	378	504	384	420	180	168	348
25 Jul	366	810	168	216	288	240	756	630	978	588	1,194	1,026
26 Jul	762	822	402	312	156	480	402	306	552	342	696	444
27 Jul	570	450	336	354	294	294	246	288	666	798	540	372
28 Jul	246	300	294	84	162	342	174	162	228	882	228	762
29 Jul	624	516	336	96	84	366	396	366	354	438	384	210
30 Jul	270	234	336	84	180	624	570	372	702	270	708	342
31 Jul	162	216	126	258	180	108	144	126	258	168	108	72

-continued-

Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
1 Jul	132	108	48	108	252	264	144	216	132	132	102	258
2 Jul	336	84	198	270	228	72	408	282	222	108	78	96
3 Jul	108	126	180	120	48	174	252	180	180	162	114	72
4 Jul	426	198	294	300	280	222	180	486	330	390	354	114
5 Jul	384	348	282	582	528	432	1,326	858	594	1098	630	624
6 Jul	1,092	360	504	539	516	312	450	186	96	183	282	108
7 Jul	144	192	288	360	253	276	266	264	204	174	432	588
8 Jul	450	522	534	354	354	360	246	156	144	30	138	318
9 Jul	180	354	264	318	120	48	84	204	66	78	24	54
10 Jul	288	294	312	228	144	138	282	390	342	282	162	252
11 Jul	606	420	192	300	192	192	360	432	714	774	228	366
12 Jul	888	390	228	150	156	222	330	744	1,242	1,512	1,032	582
13 Jul	630	780	780	510	348	570	816	1,086	1,806	1,422	996	1,314
14 Jul	504	1,068	588	888	426	450	264	312	384	1,092	1,482	1,548
15 Jul	114	228	354	1,554	948	390	570	858	984	1,590	1,686	2,226
16 Jul	1,872	1,212	1,248	2,976	3,462	2,472	2,430	2,850	1,866	1,260	2,736	2,520
17 Jul	954	786	768	552	1,374	5,262	6,234	6,234	4,692	4,458	2,400	2,556
18 Jul	936	1,236	1,332	2,022	2,382	2,322	3,111	2,667	2,604	4,758	5,880	4,932
19 Jul	1,944	3,444	3,690	3,144	2,100	2,310	3,366	3,978	2,916	3,894	3,186	2,790
20 Jul	2,280	1,650	2,418	3,432	2,436	2,088	1,782	2,436	2,508	1,848	1,974	2,958
21 Jul	1,200	1,344	2,598	3,516	3,870	3,498	2,358	3,210	2,316	2,094	1,314	996
22 Jul	714	1,614	1,518	1,584	1,320	1,248	1,116	1,446	864	648	834	588
23 Jul	1,488	960	798	876	1,938	2,508	1,140	822	828	1,116	1,500	1,224
24 Jul	456	234	168	492	516	288	726	882	366	888	1,452	756
25 Jul	1,158	1,608	1,662	1,548	1,854	2,682	2,742	1,500	1,866	1,734	1,476	1,404
26 Jul	414	324	624	582	702	768	546	870	864	750	672	660
27 Jul	384	1,296	822	732	1,476	780	1,416	744	516	492	324	384
28 Jul	522	798	540	1,038	1,728	714	822	1,152	732	828	660	576
29 Jul	684	438	396	876	606	396	564	408	786	474	300	324
30 Jul	306	270	396	390	840	564	180	324	396	330	414	186
31 Jul	246	204	270	120	366	510	480	708	1,230	1,338	1,026	264

-continued-

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	468	312	264	246	168	336	222	312	282	576	342	144
2 Aug	192	570	378	276	204	216	258	216	288	330	294	312
3 Aug	720	1,482	786	330	264	600	576	1,008	1,560	1,758	714	990
4 Aug	318	252	252	174	273	390	408	414	720	324	390	240
5 Aug	516	372	252	276	198	132	126	534	282	228	246	174
6 Aug	750	372	330	342	108	174	150	138	216	342	378	150
7 Aug	624	330	300	150	78	138	156	162	432	426	528	294
8 Aug	360	426	210	72	72	90	174	126	414	192	300	396
9 Aug	210	216	198	144	60	90	162	138	324	270	318	324
10 Aug	252	414	168	192	114	90	114	72	198	132	324	144
11 Aug	300	108	78	186	48	54	96	30	72	102	96	120
12 Aug	108	66	114	66	72	54	42	96	114	108	150	150
13 Aug	198	210	198	204	84	114	138	84	234	276	366	198
14 Aug	186	144	126	132	108	96	168	186	144	162	162	174
15 Aug	318	168	174	66	48	60	90	222	318	300	402	216
16 Aug	192	102	78	60	54	66	300	264	198	210	312	294
17 Aug	66	156	96	72	72	54	102	180	126	204	318	276
18 Aug	228	192	90	60	84	90	174	204	216	234	192	174
19 Aug	288	234	120	54	24	30	132	102	108	198	96	72
Total	27,576	24,366	20,658	16,302	15,465	17,256	16,842	21,194	23,310	25,299	24,756	25,997
Hr %	3.7	3.3	2.8	2.2	2.1	2.3	2.3	2.8	3.1	3.4	3.3	3.5
Cum %	3.7	7.0	9.8	12.0	14.0	16.4	18.6	21.5	24.6	28.0	31.3	34.8

-continued-

Appendix A5.–Page 4 of 4.

Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
1 Aug	540	492	984	666	474	390	588	192	564	414	750	474
2 Aug	408	510	498	522	870	1,254	582	1,440	2,016	3,606	1,794	1,104
3 Aug	1,020	1,542	732	1,878	1,110	1,428	1,290	870	1,734	1,194	852	750
4 Aug	198	246	336	420	780	510	378	828	888	552	588	780
5 Aug	228	306	288	354	168	354	480	498	636	1,206	810	444
6 Aug	114	228	192	168	198	420	570	720	462	624	1,074	540
7 Aug	324	246	414	630	228	792	492	384	414	240	372	432
8 Aug	240	234	216	282	222	324	492	462	390	348	132	318
9 Aug	90	444	204	372	642	474	756	570	780	768	540	306
10 Aug	222	282	282	222	144	126	372	552	498	444	534	384
11 Aug	198	72	180	210	270	324	192	216	408	408	342	258
12 Aug	258	108	240	240	294	312	348	204	354	270	246	168
13 Aug	306	264	372	438	582	240	162	156	198	246	396	192
14 Aug	222	288	408	474	558	642	528	378	684	852	402	414
15 Aug	288	516	516	600	594	504	618	858	858	750	624	528
16 Aug	672	624	402	708	594	492	588	498	564	996	960	336
17 Aug	420	504	462	462	444	360	480	684	672	516	588	228
18 Aug	150	90	198	150	144	204	660	366	486	540	516	186
19 Aug	264	144	114	204	186	252	480	420	270	552	342	132
	28,002	30,030	31,332	39,461	40,265	41,934	45,048	47,181	45,666	50,463	45,750	39,612
Hr %	3.8	4.0	4.2	5.3	5.4	5.6	6.1	6.3	6.1	6.8	6.2	5.3
Cum %	38.6	42.6	46.8	52.1	57.6	63.2	69.3	75.6	81.7	88.5	94.7	100.0

Appendix A6.--Kenai River south bank DIDSON estimates (all species) by hour, 2010.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Jul	18	48	54	36	24	48	66	24	36	36	78	42
2 Jul	24	30	12	18	6	24	18	30	18	102	42	78
3 Jul	24	12	36	18	6	24	24	12	12	18	12	78
4 Jul	36	6	72	6	30	36	18	48	60	18	162	150
5 Jul	18	12	42	30	18	30	60	24	48	18	42	126
6 Jul	30	48	54	36	78	18	84	48	96	228	84	108
7 Jul	54	18	42	48	18	18	36	36	96	78	132	84
8 Jul	180	78	36	12	42	12	48	114	60	24	252	102
9 Jul	90	54	96	24	66	60	108	42	198	120	192	264
10 Jul	72	48	66	36	18	30	18	24	72	36	180	168
11 Jul	78	72	18	36	60	30	18	30	66	162	138	444
12 Jul	240	174	222	96	78	90	120	78	156	186	138	810
13 Jul	582	396	402	198	150	114	276	312	377	606	348	684
14 Jul	348	162	204	174	138	24	270	382	145	264	339	519
15 Jul	198	138	438	174	108	78	126	174	180	198	216	114
16 Jul	1,158	516	816	1,158	876	252	540	558	660	1,074	870	1,734
17 Jul	1,206	1,200	390	456	312	750	1,116	1,302	1,914	1,656	2,058	3,660
18 Jul	1,428	1,452	852	570	294	174	1,302	3,228	2,154	1,212	1,614	888
19 Jul	2,868	1,848	828	630	690	876	1,836	2,550	2,580	3,210	2,046	2,166
20 Jul	756	516	354	156	288	438	1,542	2,184	1,524	1,608	1,650	1,134
21 Jul	2,178	930	258	168	144	426	882	696	1,026	930	834	582
22 Jul	540	906	732	900	588	684	510	1,362	1,236	1,404	1,086	852
23 Jul	1,704	984	150	156	240	708	354	672	1,128	618	486	546
24 Jul	678	390	414	138	84	222	450	162	204	612	366	426
25 Jul	642	786	732	732	84	228	264	864	1,470	1,050	858	894
26 Jul	828	210	108	66	84	126	90	264	588	756	456	426
27 Jul	222	144	108	78	54	36	48	162	270	258	408	228
28 Jul	300	138	150	48	42	78	54	234	528	216	492	300
29 Jul	594	180	90	78	54	90	276	162	276	192	420	462
30 Jul	42	144	186	120	90	300	282	480	516	336	282	324
31 Jul	264	228	222	84	48	60	96	102	150	108	204	90

-continued-

Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
1 Jul	96	66	156	48	102	282	96	12	30	48	36	102
2 Jul	138	144	42	84	78	144	66	54	42	6	6	12
3 Jul	24	42	66	30	72	48	186	114	114	36	48	18
4 Jul	126	582	228	198	247	142	72	156	54	96	12	18
5 Jul	222	360	174	294	282	312	390	504	342	108	306	156
6 Jul	264	324	558	342	270	126	144	114	102	108	108	48
7 Jul	90	6	138	96	48	60	90	30	60	138	102	102
8 Jul	66	48	132	108	204	120	186	108	54	132	108	408
9 Jul	198	210	138	132	108	54	54	18	18	30	24	30
10 Jul	210	126	210	102	126	66	66	72	66	84	108	114
11 Jul	252	180	144	102	114	204	138	342	300	120	378	126
12 Jul	486	708	692	446	406	338	222	360	444	300	366	300
13 Jul	1,482	1,074	612	600	300	138	186	882	606	1,380	672	1,134
14 Jul	484	348	690	414	486	486	204	240	354	468	408	534
15 Jul	132	348	456	1,122	918	486	702	474	378	642	1,380	1,140
16 Jul	822	900	834	618	906	1,230	912	1,080	390	426	810	1,572
17 Jul	1,176	1,152	1,092	600	480	1,470	1,452	1,632	1,494	918	2,064	1,776
18 Jul	1,224	1,452	1,548	1,932	1,272	1,236	1,727	1,872	4,404	4,740	5,028	2,898
19 Jul	2,442	3,648	4,614	4,356	2,130	1,680	1,050	2,964	2,382	1,128	2,280	1,878
20 Jul	1,332	1,854	2,082	1,296	1,266	1,356	1,728	1,770	1,980	2,478	1,350	1,566
21 Jul	498	1,308	594	1,782	1,932	2,406	1,320	1,278	3,558	1,578	1,548	1,206
22 Jul	1,344	780	540	1,062	1,578	912	660	1,332	1,038	672	732	2,412
23 Jul	792	1,194	780	1,164	1,698	1,680	1,644	1,446	1,242	1,014	678	1,494
24 Jul	192	210	318	210	174	540	336	516	444	540	990	1,260
25 Jul	1,680	1,416	798	1,278	1,500	2,580	2,634	978	834	1,380	1,206	780
26 Jul	738	420	702	858	516	462	714	864	498	210	636	414
27 Jul	312	156	324	648	1,020	702	570	858	618	570	384	312
28 Jul	384	510	1,020	540	1,752	1,614	840	414	594	540	750	1,182
29 Jul	834	714	438	588	450	618	240	504	690	420	450	150
30 Jul	600	336	186	534	426	420	696	594	618	492	588	570
31 Jul	216	180	204	462	204	558	420	1,164	330	426	522	552

-continued-

Appendix A6.–Page 3 of 4.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	342	126	90	132	72	120	132	180	246	294	420	354
2 Aug	372	138	108	78	90	132	108	102	198	138	264	252
3 Aug	1,206	720	252	342	78	714	516	1,104	564	720	564	552
4 Aug	318	120	120	72	96	210	162	336	906	780	444	390
5 Aug	354	174	174	72	36	30	108	216	192	174	138	96
6 Aug	300	234	120	108	30	42	108	126	228	294	216	264
7 Aug	162	204	84	60	60	12	174	192	654	270	348	360
8 Aug	474	390	78	126	60	48	198	144	270	294	264	234
9 Aug	198	228	222	90	36	96	174	150	558	552	348	402
10 Aug	282	324	84	60	72	120	114	96	300	186	258	282
11 Aug	336	126	72	210	42	12	48	60	84	150	240	120
12 Aug	150	114	54	30	54	48	66	72	102	114	192	228
13 Aug	180	126	96	102	156	30	90	102	150	192	282	114
14 Aug	144	120	96	96	60	54	126	132	240	336	144	246
15 Aug	240	216	156	30	66	78	144	246	222	246	294	210
16 Aug	390	72	72	42	12	6	180	198	252	222	162	444
17 Aug	66	102	42	48	96	60	120	180	240	432	348	390
18 Aug	192	66	42	42	42	24	120	120	144	222	306	252
19 Aug	324	84	78	48	36	78	90	144	216	336	306	264
Total	23,430	15,552	10,224	8,268	6,006	7,998	13,710	20,260	23,610	23,286	22,023	23,937
Hr %	4.0	2.6	1.7	1.4	1.0	1.4	2.3	3.4	4.0	3.9	3.7	4.1
Cum %	4.0	6.6	8.3	9.7	10.7	12.1	14.4	17.8	21.8	25.8	29.5	33.6

-continued-

Appendix A6.–Page 4 of 4.

Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
1 Aug	306	594	606	948	270	276	876	558	666	486	378	774
2 Aug	204	564	546	1,056	996	546	1,014	1,164	1,260	696	630	2,520
3 Aug	654	1,458	2,040	1,236	2,808	2,616	2,400	1,986	1,218	738	888	564
4 Aug	216	126	372	450	324	300	804	720	570	360	180	306
5 Aug	180	192	228	408	264	294	312	354	516	384	390	324
6 Aug	228	288	240	294	354	480	534	384	390	618	426	576
7 Aug	198	438	366	330	756	450	702	846	732	612	648	534
8 Aug	120	360	342	318	1,002	618	654	642	732	1,122	1,176	528
9 Aug	390	318	444	576	564	624	744	576	414	522	426	348
10 Aug	144	198	336	378	666	624	636	636	954	612	372	708
11 Aug	144	186	198	204	414	534	684	630	768	420	180	240
12 Aug	228	138	240	288	384	366	444	444	528	480	516	204
13 Aug	108	228	264	228	522	522	438	480	666	588	372	342
14 Aug	282	390	288	462	228	690	798	702	690	1,014	690	318
15 Aug	300	342	486	678	522	612	618	960	1,248	828	978	642
16 Aug	348	354	390	804	648	834	702	1,050	1,122	1,110	918	474
17 Aug	216	258	396	576	282	510	576	486	576	852	576	222
18 Aug	162	462	366	330	366	384	846	498	768	762	660	318
19 Aug	228	180	288	360	390	510	696	882	738	624	612	360
Total	23,512	27,870	28,946	31,970	32,825	34,260	34,223	36,744	38,634	34,056	35,094	34,566
Hr %	4.0	4.7	4.9	5.4	5.6	5.8	5.8	6.2	6.5	5.8	5.9	5.8
Cum %	37.5	42.2	47.1	52.6	58.1	63.9	69.7	75.9	82.5	88.2	94.2	100.0



## **APPENDIX B: KASILOF RIVER DATA**

Appendix B1.-Estimated salmon migration along the north bank of the Kasilof River, 2010.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	1,656	1,656	0	0	0	0	0	0
16 Jun	736	2,392	0	0	0	0	0	0
17 Jun	436	2,828	0	0	0	0	0	0
18 Jun	339	3,166	0	0	0	0	0	0
19 Jun	436	3,602	0	0	0	0	0	0
20 Jun	333	3,935	0	0	0	0	0	0
21 Jun	666	4,601	0	0	0	0	0	0
22 Jun	1,826	6,428	0	0	0	0	0	0
23 Jun	4,276	10,704	0	0	0	0	0	0
24 Jun	3,198	13,902	0	0	0	0	0	0
25 Jun	2,923	16,825	0	0	0	0	0	0
26 Jun	4,128	20,953	0	0	0	0	0	0
27 Jun	3,589	24,543	0	0	0	0	0	0
28 Jun	1,231	25,774	0	0	0	0	0	0
29 Jun	1,694	27,468	0	0	0	0	0	0
30 Jun	3,150	30,618	0	0	0	0	0	0
1 Jul	1,258	31,876	0	0	0	0	0	0
2 Jul	1,125	33,001	0	0	0	0	0	0
3 Jul	1,688	34,689	0	0	0	0	0	0
4 Jul	1,598	36,287	0	0	0	0	0	0
5 Jul	2,499	38,787	0	0	0	0	0	0
6 Jul	709	39,496	0	0	0	0	0	0
7 Jul	1,401	40,897	0	0	0	0	0	0
8 Jul	1,486	42,384	0	0	0	0	0	0
9 Jul	869	43,253	0	0	0	0	0	0
10 Jul	1,794	45,047	0	0	0	0	0	0
11 Jul	1,513	46,560	0	0	0	0	0	0
12 Jul	5,755	52,315	0	0	0	0	0	0
13 Jul	2,595	54,910	0	0	0	0	0	0
14 Jul	5,950	60,860	0	0	0	0	0	0
15 Jul	6,831	67,691	0	0	0	0	0	0
16 Jul	11,626	79,317	0	0	0	0	0	0
17 Jul	21,745	101,062	0	0	0	0	0	0
18 Jul	14,780	115,842	0	0	0	0	0	0
19 Jul	6,177	122,019	0	0	0	0	0	0
20 Jul	7,580	129,598	0	0	0	0	0	0
21 Jul	5,549	135,147	0	0	0	0	0	0
22 Jul	5,090	140,237	0	0	0	0	0	0
23 Jul	4,176	144,413	0	0	0	0	0	0
24 Jul	4,746	149,159	0	0	0	0	0	0
25 Jul	1,741	150,901	0	0	0	0	0	0
26 Jul	1,034	151,935	0	0	0	0	0	0
27 Jul	2,759	154,694	0	0	0	0	0	0
28 Jul	4,451	159,144	0	0	0	0	0	0
29 Jul	2,282	161,426	0	0	0	0	0	0
30 Jul	1,922	163,348	0	0	0	0	0	0
31 Jul	2,992	166,340	0	0	0	0	0	0

-continued-

Appendix B1.–Page 2 of 2.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Aug	2,049	168,389	0	0	0	0	0	0
2 Aug	4,033	172,422	0	0	0	0	0	0
3 Aug	1,247	173,670	0	0	0	0	0	0
4 Aug	847	174,517	0	0	0	0	0	0
5 Aug	1,929	176,446	0	0	0	0	0	0
6 Aug	2,350	178,796	0	0	0	0	0	0
7 Aug	1,264	180,060	136	136	0	0	90	90
8 Aug	1,303	181,363	240	376	34	34	69	159
9 Aug	722	182,085	145	521	36	70	90	249
10 Aug	429	182,514	104	625	35	105	81	330
11 Aug	667	183,180	143	768	48	153	167	496
12 Aug	809	183,989	156	924	31	184	187	683
13 Aug	962	184,951	124	1,049	0	184	124	807
14 Aug	1,077	186,028	38	1,087	0	184	115	923
15 Aug	1,017	187,045	46	1,133	0	184	46	969
	Percent	98.8		0.6		0.1		0.5
Total		189,332						

*Note:* Numbers have been converted to Bendix equivalents.

Appendix B2.—Estimated salmon passage along the south bank, Kasilof River, 2010.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	867	867	0	0	0	0	0	0
16 Jun	388	1,255	0	0	0	0	0	0
17 Jun	210	1,465	0	0	0	0	0	0
18 Jun	231	1,696	0	0	0	0	0	0
19 Jun	236	1,933	0	0	0	0	0	0
20 Jun	365	2,298	0	0	0	0	0	0
21 Jun	1,450	3,747	0	0	0	0	0	0
22 Jun	2,667	6,414	0	0	0	0	0	0
23 Jun	5,717	12,131	0	0	0	0	0	0
24 Jun	6,283	18,414	0	0	0	0	0	0
25 Jun	2,834	21,248	0	0	0	0	0	0
26 Jun	3,037	24,285	0	0	0	0	0	0
27 Jun	4,484	28,768	0	0	0	0	0	0
28 Jun	760	29,528	0	0	0	0	0	0
29 Jun	1,323	30,851	0	0	0	0	0	0
30 Jun	3,608	34,459	0	0	0	0	0	0
1 Jul	1,028	35,488	0	0	0	0	0	0
2 Jul	1,009	36,496	0	0	0	0	0	0
3 Jul	2,175	38,671	0	0	0	0	0	0
4 Jul	1,691	40,363	0	0	0	0	0	0
5 Jul	3,545	43,907	0	0	0	0	0	0
6 Jul	388	44,296	0	0	0	0	0	0
7 Jul	1,074	45,370	0	0	0	0	0	0
8 Jul	1,185	46,554	0	0	0	0	0	0
9 Jul	672	47,227	0	0	0	0	0	0
10 Jul	1,436	48,663	0	0	0	0	0	0
11 Jul	944	49,607	0	0	0	0	0	0
12 Jul	1,543	51,150	0	0	0	0	0	0
13 Jul	1,483	52,633	0	0	0	0	0	0
14 Jul	779	53,412	0	0	0	0	0	0
15 Jul	654	54,065	0	0	0	0	0	0
16 Jul	887	54,952	0	0	0	0	0	0
17 Jul	753	55,705	0	0	0	0	0	0
18 Jul	1,752	57,458	0	0	0	0	0	0
19 Jul	1,550	59,008	0	0	0	0	0	0
20 Jul	791	59,799	0	0	0	0	0	0
21 Jul	1,698	61,497	0	0	0	0	0	0
22 Jul	1,087	62,584	0	0	0	0	0	0
23 Jul	1,277	63,861	0	0	0	0	0	0
24 Jul	2,396	66,257	0	0	0	0	0	0
25 Jul	772	67,029	0	0	0	0	0	0
26 Jul	393	67,422	0	0	0	0	0	0
27 Jul	650	68,071	0	0	0	0	0	0
28 Jul	1,290	69,362	0	0	0	0	0	0
29 Jul	567	69,929	0	0	0	0	0	0
30 Jul	441	70,370	0	0	0	0	0	0
31 Jul	623	70,993	0	0	0	0	0	0

-continued-

Appendix B2.–Page 2 of 2.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Aug	635	71,628	0	0	0	0	0	0
2 Aug	1,570	73,198	0	0	0	0	0	0
3 Aug	537	73,735	0	0	0	0	0	0
4 Aug	424	74,159	0	0	0	0	0	0
5 Aug	543	74,702	0	0	0	0	0	0
6 Aug	817	75,518	0	0	0	0	0	0
7 Aug	565	76,083	61	61	0	0	40	40
8 Aug	876	76,959	161	222	23	23	46	86
9 Aug	575	77,534	115	337	29	52	72	158
10 Aug	276	77,810	67	405	22	74	52	210
11 Aug	346	78,156	74	479	25	99	86	296
12 Aug	471	78,627	91	570	18	117	109	405
13 Aug	475	79,102	62	632	0	117	61	467
14 Aug	391	79,493	14	646	0	117	42	509
15 Aug	476	79,969	21	667	0	117	22	530
	Proportion	97.3		0.8		0.1		0.6
	Total	81,285						

*Note:* Numbers have been converted to Bendix equivalents.

Appendix B3.–Kasilof River DIDSON subsample counts and Bendix equivalents for both banks, 2010.

Date	North Bank				South bank			
	DIDSON Estimate		Bendix equivalent		DIDSON Estimate		Bendix equivalent	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
15 Jun	1,848	1,848	1,656	1,656	1,014	1,014	867	867
16 Jun	810	2,658	736	2,392	546	1,560	388	1,256
17 Jun	474	3,132	436	2,828	354	1,914	210	1,465
18 Jun	366	3,498	339	3,166	378	2,292	231	1,696
19 Jun	474	3,972	436	3,602	384	2,676	236	1,933
20 Jun	360	4,332	333	3,935	522	3,198	365	2,298
21 Jun	732	5,064	666	4,601	1,548	4,746	1,450	3,748
22 Jun	2,040	7,104	1,826	6,428	2,616	7,362	2,667	6,414
23 Jun	4,818	11,922	4,276	10,704	5,184	12,546	5,717	12,131
24 Jun	3,594	15,516	3,198	13,902	5,652	18,198	6,283	18,414
25 Jun	3,282	18,798	2,923	16,825	2,760	20,958	2,834	21,248
26 Jun	4,650	23,448	4,128	20,953	2,934	23,892	3,037	24,285
27 Jun	4,038	27,486	3,589	24,543	4,157	28,049	4,484	28,769
28 Jun	1,368	28,854	1,231	25,774	912	28,961	760	29,529
29 Jun	1,890	30,744	1,694	27,468	1,434	30,395	1,323	30,852
30 Jun	3,540	34,284	3,150	30,618	3,420	33,815	3,608	34,460
1 Jul	1,398	35,682	1,258	31,876	1,164	34,979	1,028	35,488
2 Jul	1,248	36,930	1,125	33,001	1,146	36,125	1,009	36,497
3 Jul	1,884	38,814	1,688	34,689	2,190	38,315	2,175	38,673
4 Jul	1,782	40,596	1,598	36,287	1,764	40,079	1,691	40,364
5 Jul	2,802	43,398	2,499	38,787	3,366	43,445	3,545	43,909
6 Jul	780	44,178	709	39,496	546	43,991	388	44,297
7 Jul	1,560	45,738	1,401	40,897	1,206	45,197	1,074	45,371
8 Jul	1,656	47,394	1,486	42,384	1,308	46,505	1,185	46,556
9 Jul	960	48,354	869	43,253	828	47,333	672	47,228
10 Jul	2,004	50,358	1,794	45,047	1,536	48,869	1,436	48,664
11 Jul	1,686	52,044	1,513	46,560	1,086	49,955	944	49,608
12 Jul	6,498	58,542	5,755	52,315	1,632	51,587	1,543	51,152
13 Jul	2,910	61,452	2,595	54,910	1,578	53,165	1,483	52,635
14 Jul	6,720	68,172	5,950	60,860	930	54,095	779	53,413
15 Jul	7,722	75,894	6,831	67,691	810	54,905	654	54,067
16 Jul	13,182	89,076	11,626	79,317	1,032	55,937	887	54,953
17 Jul	24,720	113,796	21,745	101,062	906	56,843	753	55,707
18 Jul	16,776	130,572	14,780	115,842	1,818	58,661	1,752	57,459
19 Jul	6,978	137,550	6,177	122,019	1,638	60,299	1,550	59,009
20 Jul	8,574	146,124	7,580	129,599	942	61,241	791	59,800
21 Jul	6,264	152,388	5,549	135,148	1,770	63,011	1,698	61,498
22 Jul	5,742	158,130	5,090	140,237	1,218	64,229	1,087	62,585
23 Jul	4,704	162,834	4,176	144,413	1,392	65,621	1,277	63,862
24 Jul	5,352	168,186	4,746	149,160	2,382	68,003	2,396	66,258
25 Jul	1,944	170,130	1,741	150,901	924	68,927	772	67,030
26 Jul	1,146	171,276	1,034	151,935	551	69,478	393	67,424
27 Jul	3,096	174,372	2,759	154,694	806	70,284	649	68,073
28 Jul	5,016	179,388	4,451	159,145	1,404	71,688	1,290	69,363
29 Jul	2,556	181,944	2,282	161,427	726	72,414	567	69,931
30 Jul	2,148	184,092	1,922	163,349	600	73,014	441	70,372
31 Jul	3,360	187,452	2,992	166,341	780	73,794	623	70,995

-continued-

Appendix B3.–Page 2 of 2.

Date	North Bank				South bank			
	DIDSON Estimate		Bendix equivalent		DIDSON Estimate		Bendix equivalent	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Aug	2,292	189,744	2,049	168,390	792	74,586	635	71,630
2 Aug	4,542	194,286	4,033	172,423	1,656	76,242	1,570	73,200
3 Aug	1,386	195,672	1,247	173,670	696	76,938	537	73,737
4 Aug	935	196,607	847	174,517	582	77,520	424	74,160
5 Aug	2,156	198,763	1,929	176,446	702	78,222	543	74,703
6 Aug	2,633	201,396	2,350	178,796	966	79,188	817	75,520
7 Aug	1,660	203,056	1,490	180,286	822	80,010	666	76,186
8 Aug	1,836	204,892	1,646	181,932	1236	81,246	1,106	77,292
9 Aug	1,099	205,991	993	182,925	942	82,188	791	78,083
10 Aug	714	206,705	650	183,575	576	82,764	418	78,501
11 Aug	1,134	207,839	1,024	184,599	690	83,454	531	79,032
12 Aug	1,314	209,153	1,183	185,782	844	84,298	689	79,721
13 Aug	1,344	210,497	1,210	186,992	756	85,054	598	80,319
14 Aug	1,368	211,865	1,231	188,223	606	85,660	447	80,766
15 Aug	1,230	213,095	1,109	189,332	678	86,338	519	81,285
Total		299,433		270,617				

Appendix B4.-Kasilof River north bank DIDSON subsample estimates by hour.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	78	60	24	30	72	36	96	60	168	150	66	156
16 Jun	132	60	42	78	6	12	6	6	12	54	36	48
17 Jun	18	42	42	66	12	12	12	6	6	36	48	0
18 Jun	30	18	30	12	12	12	6	6	0	30	30	12
19 Jun	6	0	24	18	14	18	16	12	12	18	6	12
20 Jun	6	0	30	0	24	0	12	6	6	6	0	0
21 Jun	18	54	42	6	36	72	36	48	42	12	6	-6
22 Jun	114	48	18	30	18	24	24	30	36	24	24	6
23 Jun	60	180	420	12	12	60	48	36	66	36	78	24
24 Jun	18	66	102	192	72	54	390	144	54	84	78	60
25 Jun	24	12	12	48	90	186	90	84	192	174	126	42
26 Jun	24	138	96	42	156	672	324	72	234	408	180	192
27 Jun	30	30	12	12	72	240	690	132	198	84	96	78
28 Jun	108	60	36	42	6	36	102	90	204	66	78	30
29 Jun	12	6	18	24	24	12	36	108	54	18	60	54
30 Jun	54	36	24	36	36	54	90	768	54	42	66	198
1 Jul	96	48	0	6	30	0	6	0	18	36	54	18
2 Jul	6	12	6	6	12	0	6	6	18	186	150	72
3 Jul	24	18	36	42	30	24	30	24	66	108	366	144
4 Jul	36	24	6	0	0	0	6	12	12	18	54	72
5 Jul	84	72	90	162	156	114	108	312	192	48	102	126
6 Jul	6	12	0	12	6	30	6	30	12	24	24	66
7 Jul	24	12	6	6	48	84	42	54	54	66	42	66
8 Jul	12	6	60	48	60	162	72	72	48	18	48	66
9 Jul	0	18	12	42	30	30	30	0	24	24	6	18
10 Jul	18	36	42	144	180	36	66	120	60	12	24	12
11 Jul	0	30	12	12	30	24	24	30	24	18	6	18
12 Jul	30	78	126	78	66	1,080	666	156	768	468	354	84
13 Jul	84	102	60	54	66	42	234	102	42	294	186	180
14 Jul	246	222	144	144	96	144	282	1,362	162	108	414	564
15 Jul	204	168	72	36	24	30	0	6	264	108	300	270

-continued-

Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
15 Jun	138	138	108	18	24	90	42	30	12	48	54	150
16 Jun	30	54	12	12	60	6	30	12	54	6	18	24
17 Jun	12	36	36	60	0	0	12	0	6	0	0	12
18 Jun	0	6	18	48	12	18	12	6	18	6	18	6
19 Jun	18	24	36	24	108	36	18	18	12	6	0	18
20 Jun	6	6	60	36	54	60	6	12	6	0	6	18
21 Jun	6	0	36	66	30	18	66	30	48	42	12	12
22 Jun	54	30	60	66	276	204	384	324	120	102	18	6
23 Jun	30	78	102	138	1,278	732	414	420	294	126	72	102
24 Jun	36	48	60	60	162	642	264	468	258	192	48	42
25 Jun	18	66	84	84	96	414	354	168	444	210	96	168
26 Jun	138	66	42	72	72	192	480	114	264	432	180	60
27 Jun	66	36	18	66	120	120	216	630	126	432	336	198
28 Jun	42	18	12	30	6	-6	90	54	90	78	42	54
29 Jun	54	66	90	54	96	180	198	150	198	84	90	204
30 Jun	270	108	60	174	204	174	204	186	204	300	90	108
1 Jul	24	156	186	84	102	90	60	78	42	150	78	36
2 Jul	60	42	30	18	48	48	48	54	126	126	126	42
3 Jul	72	84	42	42	54	96	72	126	114	90	108	72
4 Jul	144	108	156	120	114	90	60	66	78	186	252	168
5 Jul	372	210	198	102	42	78	36	36	36	42	42	42
6 Jul	36	96	156	120	12	48	12	12	6	36	6	12
7 Jul	102	144	138	276	186	18	60	66	24	12	18	12
8 Jul	18	84	78	108	282	90	90	72	102	42	12	6
9 Jul	36	36	0	84	66	156	132	42	84	30	54	6
10 Jul	42	90	102	186	120	360	108	24	138	54	18	12
11 Jul	6	36	0	6	18	42	192	102	252	342	372	90
12 Jul	228	156	42	24	24	84	306	366	204	612	312	186
13 Jul	84	42	36	0	30	48	90	480	96	54	336	168
14 Jul	348	180	120	18	48	90	60	60	780	276	414	438
15 Jul	846	288	252	228	144	198	156	246	1,938	672	732	540

-continued-

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
16 Jul	528	120	114	144	78	126	66	24	66	1,056	588	144
17 Jul	1,410	528	762	390	588	654	276	186	276	702	2,130	1,242
18 Jul	924	858	810	660	504	510	366	492	384	678	336	936
19 Jul	978	420	432	498	300	276	114	306	162	102	144	282
20 Jul	978	402	426	492	306	282	102	192	30	144	222	150
21 Jul	114	78	120	324	348	126	282	516	354	174	288	312
22 Jul	78	54	24	12	294	210	294	288	156	330	198	360
23 Jul	6	6	78	18	30	48	114	48	198	210	156	108
24 Jul	78	42	30	18	246	138	108	726	312	414	228	72
25 Jul	102	72	54	60	30	54	162	72	72	84	60	96
26 Jul	54	48	30	6	0	12	42	126	36	42	30	30
27 Jul	420	42	24	12	18	18	18	114	216	30	216	126
28 Jul	204	90	96	84	96	198	174	390	294	132	306	474
29 Jul	48	6	18	0	36	6	66	0	132	258	84	252
30 Jul	18	24	42	6	18	12	30	12	12	84	168	102
31 Jul	114	24	66	54	24	60	102	66	180	138	432	228
1 Aug	0	6	12	12	6	0	0	12	24	30	18	342
2 Aug	78	120	222	78	108	120	150	426	120	156	210	438
3 Aug	12	6	24	24	36	12	18	96	30	30	90	54
4 Aug	12	6	18	6	6	12	0	6	30	48	6	18
5 Aug	24	6	6	12	0	0	12	12	6	66	66	46
6 Aug	39	18	24	12	6	24	12	114	50	63	108	81
7 Aug	78	12	12	18	12	36	36	48	24	186	24	66
8 Aug	18	12	36	24	6	48	84	48	66	114	96	132
9 Aug	43	6	12	0	12	24	78	36	42	144	126	78
10 Aug	36	24	18	12	6	6	24	36	30	36	36	24
11 Aug	30	18	12	12	30	12	18	6	60	30	36	42
12 Aug	54	42	36	12	24	12	36	12	60	120	72	84
13 Aug	72	36	42	18	6	18	30	72	72	84	54	36
14 Aug	12	42	54	30	36	0	12	24	60	36	36	120
15 Aug	48	6	18	0	12	36	48	30	54	6	42	24
Total	8,212	4,842	5,316	4,488	4,718	6,390	6,430	8,430	6,710	8,505	9,714	9,181
Hr %	3.9	2.3	2.5	2.1	2.2	3.0	3.0	4.0	3.1	4.0	4.6	4.3
Cum %	3.9	6.1	8.6	10.7	12.9	15.9	19.0	22.9	26.1	30.1	34.6	38.9

-continued-

Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
16 Jul	984	570	546	282	102	180	354	516	948	2,442	1,302	1,902
17 Jul	504	1,698	1,320	654	732	798	942	900	1,200	1,662	3,840	1,326
18 Jul	1,344	810	744	1,026	714	708	468	756	786	300	300	1,362
19 Jul	90	84	762	516	330	396	270	174	138	72	72	60
20 Jul	228	306	426	978	618	816	312	330	252	276	138	168
21 Jul	138	336	168	396	396	732	342	276	216	96	96	36
22 Jul	342	222	216	174	336	702	486	276	270	270	108	42
23 Jul	186	126	240	240	216	330	468	342	510	480	270	276
24 Jul	366	264	222	144	84	204	660	336	96	150	162	252
25 Jul	90	72	66	78	144	90	108	150	78	18	42	90
26 Jul	66	30	48	78	108	30	36	48	132	66	6	42
27 Jul	150	144	114	108	60	66	60	72	288	108	234	438
28 Jul	414	258	384	192	150	192	180	126	234	234	36	78
29 Jul	240	270	72	162	192	162	96	78	96	174	84	24
30 Jul	156	222	312	78	126	54	90	102	108	120	174	78
31 Jul	264	342	252	126	132	168	78	42	102	90	228	48
1 Aug	234	180	222	246	114	114	162	162	54	228	36	78
2 Aug	558	498	228	198	300	114	114	126	48	42	72	18
3 Aug	78	48	78	78	192	90	126	120	66	48	24	6
4 Aug	41	36	78	60	84	90	132	78	42	72	30	24
5 Aug	66	138	216	262	210	222	354	144	108	84	48	48
6 Aug	102	102	60	144	186	312	186	318	228	222	192	30
7 Aug	84	60	54	114	78	102	114	106	150	84	108	54
8 Aug	138	72	48	198	114	72	96	48	126	72	96	72
9 Aug	36	36	36	60	42	42	72	60	48	18	42	6
10 Aug	78	36	12	36	24	54	18	12	54	48	24	30
11 Aug	78	48	90	84	42	36	96	54	120	42	72	66
12 Aug	54	72	54	54	48	66	30	54	150	138	6	24
13 Aug	42	96	96	102	18	120	90	36	42	54	102	6
14 Aug	114	42	72	24	108	60	72	54	96	30	156	78
15 Aug	90	48	114	96	96	138	54	90	54	96	0	30
Total	10,691	9,798	9,720	9,412	9,984	11,676	10,938	10,438	13,014	12,624	12,060	9,804
Hr %	5.0	4.6	4.6	4.4	4.7	5.5	5.1	4.9	6.1	5.9	5.7	4.6
Cum %	43.9	48.5	53.1	57.5	62.2	67.7	72.8	77.7	83.8	89.7	95.4	100.0

Appendix B5.–Kasilof River south bank subsample DIDSON estimates by hour, 2010.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	24	66	36	36	12	42	24	66	108	72	42	126
16 Jun	54	66	24	36	36	36	12	6	6	6	36	24
17 Jun	12	24	48	18	18	18	0	6	6	18	30	6
18 Jun	24	24	24	48	12	18	6	6	6	18	24	6
19 Jun	6	30	54	24	18	6	-12	6	0	6	0	0
20 Jun	24	24	12	90	6	18	30	0	6	6	12	0
21 Jun	36	42	60	30	42	48	18	36	12	42	36	12
22 Jun	174	342	192	204	78	36	72	72	18	12	12	54
23 Jun	156	336	888	210	48	522	510	174	90	42	102	108
24 Jun	90	168	456	624	126	228	468	402	144	96	138	114
25 Jun	42	36	84	174	258	144	66	216	438	198	162	96
26 Jun	144	84	162	150	480	414	120	120	186	216	114	60
27 Jun	66	30	72	132	54	630	276	162	432	444	156	126
28 Jun	102	96	42	54	12	48	96	42	24	30	24	78
29 Jun	48	30	6	30	6	30	24	174	36	12	108	72
30 Jun	156	72	66	60	84	54	108	360	408	126	186	480
1 Jul	48	36	12	6	0	0	18	6	6	18	60	78
2 Jul	36	36	30	30	6	0	6	6	36	96	108	18
3 Jul	36	114	78	84	78	78	42	42	144	246	252	156
4 Jul	24	24	12	6	0	12	6	-6	12	12	42	180
5 Jul	198	42	252	234	102	132	126	60	120	126	156	408
6 Jul	24	24	24	18	60	12	6	12	24	30	42	42
7 Jul	18	24	18	42	42	78	198	60	42	36	60	84
8 Jul	24	60	90	30	132	66	72	78	30	12	42	30
9 Jul	36	42	30	48	18	54	12	12	18	12	30	36
10 Jul	48	84	54	234	162	30	60	66	84	84	60	30
11 Jul	18	30	18	42	36	72	18	30	54	18	42	6
12 Jul	90	78	48	66	66	234	54	66	60	48	120	96
13 Jul	72	24	48	36	18	30	72	18	72	156	312	174
14 Jul	36	42	48	30	24	42	78	54	12	6	114	108
15 Jul	42	36	36	0	0	12	12	0	126	72	54	120

-continued-

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	24	66	36	36	12	42	24	66	108	72	42	126
16 Jun	54	66	24	36	36	36	12	6	6	6	36	24
17 Jun	12	24	48	18	18	18	0	6	6	18	30	6
18 Jun	24	24	24	48	12	18	6	6	6	18	24	6
19 Jun	6	30	54	24	18	6	-12	6	0	6	0	0
20 Jun	24	24	12	90	6	18	30	0	6	6	12	0
21 Jun	36	42	60	30	42	48	18	36	12	42	36	12
22 Jun	174	342	192	204	78	36	72	72	18	12	12	54
23 Jun	156	336	888	210	48	522	510	174	90	42	102	108
24 Jun	90	168	456	624	126	228	468	402	144	96	138	114
25 Jun	42	36	84	174	258	144	66	216	438	198	162	96
26 Jun	144	84	162	150	480	414	120	120	186	216	114	60
27 Jun	66	30	72	132	54	630	276	162	432	444	156	126
28 Jun	102	96	42	54	12	48	96	42	24	30	24	78
29 Jun	48	30	6	30	6	30	24	174	36	12	108	72
30 Jun	156	72	66	60	84	54	108	360	408	126	186	480
1 Jul	48	36	12	6	0	0	18	6	6	18	60	78
2 Jul	36	36	30	30	6	0	6	6	36	96	108	18
3 Jul	36	114	78	84	78	78	42	42	144	246	252	156
4 Jul	24	24	12	6	0	12	6	-6	12	12	42	180
5 Jul	198	42	252	234	102	132	126	60	120	126	156	408
6 Jul	24	24	24	18	60	12	6	12	24	30	42	42
7 Jul	18	24	18	42	42	78	198	60	42	36	60	84
8 Jul	24	60	90	30	132	66	72	78	30	12	42	30
9 Jul	36	42	30	48	18	54	12	12	18	12	30	36
10 Jul	48	84	54	234	162	30	60	66	84	84	60	30
11 Jul	18	30	18	42	36	72	18	30	54	18	42	6
12 Jul	90	78	48	66	66	234	54	66	60	48	120	96
13 Jul	72	24	48	36	18	30	72	18	72	156	312	174
14 Jul	36	42	48	30	24	42	78	54	12	6	114	108
15 Jul	42	36	36	0	0	12	12	0	126	72	54	120

-continued-

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
16 Jul	120	108	66	36	6	24	6	12	36	48	72	18
17 Jul	30	54	48	24	54	84	24	30	36	24	30	42
18 Jul	24	48	132	42	48	36	78	66	36	0	0	18
19 Jul	282	48	162	120	72	156	36	48	78	24	48	6
20 Jul	42	18	30	12	6	18	12	12	72	30	18	24
21 Jul	96	72	42	108	156	36	120	90	18	216	120	54
22 Jul	30	12	30	78	84	126	72	60	102	72	60	36
23 Jul	12	24	6	6	18	48	72	114	114	36	102	48
24 Jul	186	222	108	60	54	90	180	228	132	72	132	114
25 Jul	78	18	48	24	30	6	78	6	6	54	54	24
26 Jul	66	30	24	12	12	20	26	32	30	48	36	18
27 Jul	24	42	18	12	18	12	30	126	48	42	108	18
28 Jul	132	78	90	42	42	24	60	108	66	60	60	66
29 Jul	12	36	36	18	6	30	6	18	60	24	24	30
30 Jul	12	30	24	6	12	6	12	24	0	6	6	18
31 Jul	48	30	42	30	6	12	42	24	18	144	48	30
1 Aug	18	24	12	42	24	12	0	42	12	24	0	66
2 Aug	48	54	24	54	60	24	132	72	30	156	144	54
3 Aug	24	36	0	6	6	6	84	48	0	30	30	48
4 Aug	0	18	12	24	6	6	24	6	12	30	18	0
5 Aug	0	6	18	0	6	6	0	36	18	54	12	12
6 Aug	6	0	12	12	6	6	54	30	36	6	84	48
7 Aug	0	24	6	18	0	0	78	36	42	36	42	36
8 Aug	24	18	18	6	6	18	84	162	24	192	42	84
9 Aug	24	42	36	18	24	12	0	90	30	60	66	84
10 Aug	48	18	36	30	18	6	30	42	48	60	18	24
11 Aug	12	18	18	42	24	12	18	24	48	54	6	36
12 Aug	36	18	12	2	6	12	36	30	66	42	30	48
13 Aug	6	36	36	36	24	30	108	30	24	30	30	0
14 Aug	30	42	30	30	18	6	6	36	18	30	6	18
15 Aug	18	12	6	36	6	18	72	24	36	6	6	12
Total	3,396	3,402	4,206	3,812	2,892	4,046	4,178	4,058	4,056	4,026	4,128	4,062
Hr %	3.7	3.7	4.5	4.1	3.1	4.4	4.5	4.4	4.4	4.3	4.4	4.4
Cum %	3.7	7.3	11.8	15.9	19.1	23.4	27.9	32.3	36.6	41.0	45.4	49.8

-continued-

Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
16 Jul	36	36	18	12	18	30	18	30	24	168	30	60
17 Jul	42	138	42	12	12	18	48	18	6	18	12	60
18 Jul	318	90	48	18	12	6	0	162	102	42	216	276
19 Jul	66	18	24	36	198	24	12	30	18	36	60	36
20 Jul	30	48	60	42	18	30	108	96	84	54	18	60
21 Jul	72	108	72	24	-6	72	42	72	90	12	18	66
22 Jul	72	54	12	72	66	24	36	30	30	18	24	18
23 Jul	36	84	78	48	204	24	132	30	42	84	18	12
24 Jul	90	132	54	78	90	18	78	108	36	66	12	42
25 Jul	54	36	6	84	30	36	30	18	24	12	54	114
26 Jul	12	12	0	36	6	6	36	30	12	6	30	12
27 Jul	43	37.2	6	42	12	12	6	24	18	18	42	48
28 Jul	180	54	30	60	36	42	60	48	0	30	6	30
29 Jul	18	90	36	66	30	42	24	6	36	36	30	12
30 Jul	36	72	66	6	48	42	24	12	30	24	54	30
31 Jul	42	12	60	60	12	36	12	0	18	12	18	24
1 Aug	60	36	42	36	36	54	66	18	48	48	36	36
2 Aug	120	90	78	108	132	84	60	30	24	12	12	54
3 Aug	6	24	66	30	30	48	36	12	36	48	18	24
4 Aug	66	24	42	36	30	48	24	48	36	30	30	12
5 Aug	72	36	54	60	24	60	36	24	24	66	42	36
6 Aug	54	48	24	72	66	36	120	108	36	30	54	18
7 Aug	30	66	36	54	48	42	66	78	0	24	36	24
8 Aug	84	54	36	72	24	72	54	66	18	18	24	36
9 Aug	30	60	48	60	12	42	36	24	60	18	30	36
10 Aug	30	42	18	6	30	12	6	0	18	6	24	6
11 Aug	42	18	30	36	48	24	6	12	42	24	60	36
12 Aug	66	66	48	18	60	30	54	54	30	32	12	36
13 Aug	18	18	0	24	60	12	48	36	24	60	30	36
14 Aug	12	6	12	30	48	24	24	36	30	24	36	54
15 Aug	24	60	54	42	24	36	42	36	24	54	12	18
Total	3,769	3,835	4,224	4,206	3,492	4,230	3,942	3,648	3,780	3,446	3,774	4,290
Hr %	4.1	4.1	4.5	4.5	3.8	4.6	4.2	3.9	4.1	3.7	4.1	4.6
Cum %	53.9	58.0	62.5	67.1	70.8	75.4	79.6	83.5	87.6	91.3	95.4	100.0



## **APPENDIX C: YENTNA RIVER DATA**

Appendix C1.—Estimated salmon passage ranges adjacent to the north bank of the Yentna River, 2010.

Date	Sockeye				Pink			
	Min	Daily Max	Min	Cum Max	Min	Daily Max	Min	Cum Max
7 Jul	11	29	11	29	0	0	0	0
8 Jul	70	124	80	153	0	0	0	0
9 Jul	138	138	218	291	0	0	0	0
10 Jul	83	163	301	454	2	14	2	14
11 Jul	41	93	342	547	0	0	2	14
12 Jul	73	198	415	744	0	0	2	14
13 Jul	101	251	516	995	2	15	3	30
14 Jul	80	287	596	1,281	16	142	20	172
15 Jul	162	458	758	1,740	19	155	38	327
16 Jul	293	677	1,051	2,417	39	296	77	623
17 Jul	648	1,642	1,699	4,058	194	1,334	272	1,958
18 Jul	446	1,296	2,145	5,354	497	2,503	769	4,461
19 Jul	251	777	2,396	6,130	586	2,374	1,355	6,835
20 Jul	202	585	2,598	6,715	190	1,052	1,545	7,887
21 Jul	336	900	2,934	7,616	346	1,491	1,891	9,378
22 Jul	456	1,257	3,390	8,873	443	2,124	2,334	11,502
23 Jul	412	1,225	3,802	10,098	815	3,152	3,149	14,654
24 Jul	234	761	4,036	10,859	991	2,899	4,141	17,553
25 Jul	157	524	4,193	11,383	602	1,706	4,742	19,259
26 Jul	286	859	4,479	12,242	604	1,908	5,346	21,166
27 Jul	386	1,075	4,865	13,317	434	1,481	5,781	22,647
28 Jul	542	1,495	5,407	14,812	818	2,966	6,598	25,613
29 Jul	209	643	5,617	15,455	635	2,083	7,233	27,695
30 Jul	206	626	5,823	16,081	455	1,771	7,688	29,467
31 Jul	492	1,526	6,314	17,607	1,277	4,887	8,965	34,354
1 Aug	658	2,069	6,973	19,676	1,948	5,883	10,913	40,237
2 Aug	547	1,695	7,519	21,371	1,668	5,312	12,581	45,548
3 Aug	238	746	7,757	22,118	670	2,628	13,251	48,176
4 Aug	323	959	8,081	23,077	532	1,960	13,784	50,137
5 Aug	404	993	8,485	24,069	206	985	13,990	51,122
6 Aug	359	814	8,844	24,884	105	632	14,094	51,753
7 Aug	165	446	9,009	25,329	167	717	14,261	52,470
8 Aug	128	329	9,137	25,659	66	332	14,327	52,802
9 Aug	212	525	9,349	26,184	77	442	14,405	53,244
10 Aug	235	652	9,585	26,836	47	265	14,451	53,509
11 Aug	185	544	9,769	27,380	69	369	14,520	53,878
12 Aug	137	361	9,906	27,742	30	187	14,551	54,065
13 Aug	123	361	10,029	28,102	28	162	14,578	54,227
14 Aug	164	466	10,193	28,569	33	214	14,611	54,440
15 Aug	64	175	10,257	28,744	13	79	14,624	54,519

-continued-

Appendix C1.–Page 2 of 2.

Date	Chum				Coho			
	Min	Daily		Cum Max	Min	Daily		Cum Max
		Max	Min			Max	Min	
7 Jul	0	0	0	0	7	25	7	25
8 Jul	0	0	0	0	12	66	19	92
9 Jul	0	0	0	0	0	0	19	92
10 Jul	7	33	7	33	24	117	43	209
11 Jul	10	41	17	74	19	81	62	290
12 Jul	0	0	17	74	48	173	110	463
13 Jul	47	171	65	245	68	274	178	737
14 Jul	60	226	124	471	243	660	421	1,397
15 Jul	93	337	217	808	216	739	637	2,136
16 Jul	132	446	349	1,253	192	834	828	2,970
17 Jul	263	897	613	2,150	669	2,661	1,497	5,631
18 Jul	416	1,108	1,029	3,258	698	3,059	2,195	8,690
19 Jul	207	562	1,236	3,820	482	2,314	2,678	11,005
20 Jul	93	285	1,329	4,105	376	1,458	3,054	12,462
21 Jul	190	496	1,519	4,602	241	1,346	3,295	13,809
22 Jul	211	576	1,730	5,177	486	2,323	3,781	16,132
23 Jul	265	728	1,995	5,906	528	2,795	4,309	18,927
24 Jul	220	628	2,215	6,534	293	1,906	4,602	20,833
25 Jul	110	320	2,325	6,854	150	1,035	4,752	21,868
26 Jul	166	466	2,492	7,320	164	1,149	4,915	23,017
27 Jul	222	579	2,713	7,899	72	602	4,988	23,619
28 Jul	440	1,138	3,154	9,037	321	2,075	5,309	25,694
29 Jul	349	883	3,502	9,920	228	1,441	5,537	27,135
30 Jul	223	583	3,725	10,503	304	1,594	5,842	28,729
31 Jul	806	2,025	4,531	12,528	819	4,336	6,661	33,065
1 Aug	898	2,327	5,429	14,855	471	3,346	7,132	36,411
2 Aug	1,071	2,625	6,499	17,480	493	3,309	7,625	39,720
3 Aug	1,133	2,322	7,632	19,802	398	2,258	8,023	41,978
4 Aug	635	1,408	8,268	21,209	188	1,266	8,211	43,244
5 Aug	467	998	8,735	22,208	116	772	8,327	44,016
6 Aug	132	403	8,867	22,610	162	852	8,489	44,868
7 Aug	278	595	9,145	23,205	97	592	8,586	45,461
8 Aug	220	450	9,365	23,655	52	320	8,638	45,781
9 Aug	271	638	9,636	24,293	111	605	8,749	46,386
10 Aug	491	930	10,127	25,223	31	230	8,781	46,616
11 Aug	593	1,055	10,720	26,278	63	413	8,844	47,029
12 Aug	378	751	11,098	27,028	78	430	8,922	47,459
13 Aug	441	788	11,539	27,816	50	310	8,972	47,769
14 Aug	797	1,519	12,336	29,336	190	925	9,162	48,694
15 Aug	189	364	12,525	29,700	31	181	9,193	48,875

Note: Ranges were extrapolated from fish wheel catch criteria and DIDSON subsample estimates and were not converted to Bendix equivalents.

Appendix C2.—Estimated salmon passage ranges adjacent to the south bank of the Yentna River, 2010.

Date	Sockeye				Pink			
	Min	Daily Max	Min	Cum Max	Min	Daily Max	Min	Cum Max
7 Jul	49	95	49	95	0	0	0	0
8 Jul	22	54	71	149	0	0	0	0
9 Jul	27	73	98	222	0	0	0	0
10 Jul	7	21	105	243	0	0	0	0
11 Jul	24	82	129	325	0	0	0	0
12 Jul	88	213	218	538	0	0	0	0
13 Jul	332	753	549	1,291	2	20	2	20
14 Jul	899	2,386	1,449	3,677	44	390	46	409
15 Jul	1,731	3,566	3,180	7,243	20	179	66	588
16 Jul	2,014	4,083	5,194	11,326	38	345	104	933
17 Jul	3,816	7,373	9,010	18,699	152	1,326	256	2,260
18 Jul	3,305	7,111	12,316	25,810	506	3,660	762	5,919
19 Jul	2,272	5,534	14,588	31,344	644	4,408	1,406	10,327
20 Jul	3,627	9,234	18,215	40,578	701	5,310	2,107	15,636
21 Jul	3,701	8,749	21,916	49,327	1,247	7,684	3,354	23,320
22 Jul	4,260	9,426	26,175	58,753	943	6,274	4,297	29,594
23 Jul	2,653	6,854	28,829	65,607	1,576	8,537	5,873	38,131
24 Jul	2,184	5,838	31,013	71,445	1,985	9,164	7,858	47,295
25 Jul	1,920	4,837	32,933	76,283	1,682	7,005	9,540	54,301
26 Jul	2,203	4,718	35,135	81,001	989	4,625	10,529	58,926
27 Jul	1,992	4,102	37,127	85,102	770	3,547	11,299	62,473
28 Jul	2,386	5,687	39,513	90,789	1,829	7,283	13,127	69,756
29 Jul	1,486	4,292	41,000	95,081	2,991	10,278	16,118	80,035
30 Jul	1,040	2,984	42,040	98,065	1,414	6,064	17,532	86,099
31 Jul	984	2,891	43,024	100,957	1,458	6,351	18,990	92,450
1 Aug	872	2,683	43,896	103,640	1,763	7,616	20,753	100,066
2 Aug	378	1,222	44,274	104,862	962	4,616	21,714	104,681
3 Aug	785	2,168	45,058	107,031	400	2,324	22,114	107,005
4 Aug	1,297	3,134	46,355	110,164	221	1,494	22,335	108,499
5 Aug	505	1,103	46,861	111,267	62	404	22,397	108,903
6 Aug	195	451	47,056	111,718	53	311	22,449	109,214
7 Aug	392	917	47,448	112,635	108	609	22,558	109,823
8 Aug	325	818	47,773	113,453	97	593	22,655	110,416
9 Aug	333	842	48,107	114,296	67	424	22,722	110,840
10 Aug	187	484	48,294	114,780	23	153	22,745	110,993
11 Aug	189	446	48,483	115,226	15	104	22,760	111,097
12 Aug	154	396	48,637	115,622	19	132	22,779	111,229
13 Aug	196	504	48,833	116,126	18	125	22,797	111,354
14 Aug	103	294	48,936	116,420	13	83	22,810	111,437
15 Aug	37	126	48,973	116,547	8	45	22,818	111,482

-continued-

Appendix C2.–Page 2 of 2.

Date	Chum				Coho			
	Min	Daily Max	Min	Cum Max	Min	Daily Max	Min	Cum Max
7 Jul	2	9	2	9	12	60	12	60
8 Jul	0	0	2	9	10	42	23	102
9 Jul	2	9	4	18	19	68	42	171
10 Jul	1	5	5	23	6	21	48	192
11 Jul	8	36	13	59	40	115	88	307
12 Jul	6	31	19	90	44	178	133	485
13 Jul	104	401	124	490	155	681	288	1,166
14 Jul	328	1,275	451	1,766	816	2,983	1,104	4,149
15 Jul	462	1,762	913	3,528	573	2,788	1,677	6,937
16 Jul	354	1,455	1,267	4,983	660	3,184	2,338	10,121
17 Jul	171	783	1,438	5,766	1,073	5,382	3,410	15,503
18 Jul	615	2,277	2,054	8,043	1,596	7,501	5,006	23,004
19 Jul	409	1,502	2,462	9,546	2,012	8,179	7,018	31,183
20 Jul	589	2,326	3,052	11,871	3,373	12,845	10,391	44,028
21 Jul	716	2,426	3,768	14,298	2,398	11,179	12,789	55,208
22 Jul	800	2,819	4,567	17,117	2,139	10,313	14,928	65,520
23 Jul	1,023	3,034	5,590	20,151	2,261	10,628	17,189	76,149
24 Jul	1,211	3,123	6,801	23,274	1,748	9,160	18,938	85,309
25 Jul	785	2,092	7,585	25,367	894	5,541	19,831	90,850
26 Jul	511	1,378	8,097	26,744	504	3,439	20,335	94,290
27 Jul	307	844	8,404	27,588	260	2,025	20,595	96,315
28 Jul	878	2,340	9,282	29,927	654	4,635	21,249	100,950
29 Jul	2,086	5,107	11,368	35,035	1,020	6,742	22,269	107,691
30 Jul	1,675	3,835	13,043	38,870	1,034	5,651	23,303	113,343
31 Jul	2,502	5,291	15,545	44,161	1,128	6,125	24,431	119,468
1 Aug	3,608	7,264	19,153	51,424	1,435	7,593	25,866	127,061
2 Aug	1,821	4,027	20,975	55,451	1,337	5,796	27,203	132,858
3 Aug	1,831	4,089	22,806	59,540	813	3,906	28,016	136,764
4 Aug	1,512	3,890	24,317	63,430	732	3,644	28,748	140,408
5 Aug	516	1,241	24,833	64,671	126	765	28,874	141,173
6 Aug	179	446	25,013	65,118	73	418	28,947	141,592
7 Aug	457	1,026	25,470	66,144	107	676	29,054	142,268
8 Aug	476	1,127	25,946	67,271	198	1,021	29,252	143,289
9 Aug	658	1,444	26,604	68,715	189	998	29,441	144,286
10 Aug	490	1,012	27,094	69,728	115	602	29,556	144,889
11 Aug	302	686	27,397	70,413	76	416	29,632	145,304
12 Aug	349	765	27,746	71,179	103	516	29,735	145,821
13 Aug	470	1,014	28,216	72,192	129	649	29,863	146,470
14 Aug	556	1,017	28,772	73,210	110	551	29,973	147,021
15 Aug	359	553	29,131	73,763	34	198	30,007	147,219

Note: Ranges were determined from fish wheel catch criteria and DIDSON subsample estimates and were not converted to Bendix equivalents.

Appendix C3.–Yentna River north bank DIDSON estimates (total fish) by hour, 2010.

Date	Estimates by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
7 Jul	6	6	0	0	0	0	0	6	6	0	0	0
8 Jul	4	4	4	4	4	4	4	12	0	0	0	18
9 Jul	6	12	18	6	6	6	0	6	6	0	0	0
10 Jul	6	0	12	18	6	0	18	0	12	6	6	6
11 Jul	36	0	12	6	0	6	0	12	0	0	12	0
12 Jul	0	12	6	-6	6	0	6	30	12	6	0	6
13 Jul	18	6	12	6	18	6	12	30	6	24	54	24
14 Jul	42	30	36	24	36	12	12	18	36	18	84	24
15 Jul	60	36	60	54	6	24	30	12	12	18	60	72
16 Jul	54	108	60	42	24	36	24	36	12	48	36	78
17 Jul	372	204	276	144	84	48	78	30	6	54	114	264
18 Jul	330	240	342	264	138	204	150	168	78	192	72	336
19 Jul	198	246	258	420	198	168	96	120	42	84	186	252
20 Jul	126	78	114	90	42	24	72	50	66	77	60	108
21 Jul	192	120	120	144	-6	60	42	108	36	78	192	114
22 Jul	192	132	108	114	90	48	72	168	48	90	204	186
23 Jul	378	330	306	240	114	144	174	180	90	90	288	180
24 Jul	366	300	198	216	78	168	156	120	102	60	162	120
25 Jul	162	162	126	90	102	78	90	78	42	48	48	60
26 Jul	168	108	96	78	120	102	48	72	30	60	132	72
27 Jul	126	168	138	114	162	90	108	36	108	48	54	64
28 Jul	160	160	160	160	160	160	160	160	160	160	186	156
29 Jul	198	306	174	258	78	114	54	108	96	84	12	90
30 Jul	174	150	138	120	84	96	60	54	60	54	108	126
31 Jul	222	246	318	276	258	210	126	168	132	282	204	168
1 Aug	534	654	402	504	222	144	138	162	132	246	222	264
2 Aug	612	552	330	390	354	324	288	426	336	348	186	294
3 Aug	450	288	192	282	108	150	66	114	84	132	138	300
4 Aug	402	216	348	168	108	132	78	138	222	180	66	48
5 Aug	126	114	96	102	108	108	72	78	108	108	78	138
6 Aug	42	42	24	48	12	66	18	48	30	36	49	42
7 Aug	72	78	54	96	60	42	30	66	36	48	48	24
8 Aug	36	24	42	30	24	42	18	18	24	42	24	36
9 Aug	48	24	18	24	12	60	24	18	42	30	54	96
10 Aug	36	48	60	66	54	48	54	36	24	18	60	36
11 Aug	60	102	54	96	138	54	60	18	30	60	36	30
12 Aug	12	48	18	18	30	48	42	42	18	30	66	42
13 Aug	36	12	54	36	18	18	30	36	30	48	78	66
14 Aug	48	48	108	54	156	120	132	102	90	72	90	120
15 Aug	54	66	18	36	42	42	24	42	30	0	54	30
Total	6,164	5,480	4,910	4,832	3,254	3,206	2,666	3,126	2,434	2,979	3,523	4,090
Hr %	6.4	5.7	5.1	5.0	3.4	3.3	2.8	3.3	2.5	3.1	3.7	4.3
Cum %	6.4	12.1	17.2	22.3	25.6	29.0	31.8	35.0	37.5	40.6	44.3	48.6

-continued-

Appendix C3.–Page 2 of 2.

Date	Estimates by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
7 Jul	0	0	0	0	0	0	0	0	0	4	4	4
8 Jul	0	6	0	0	18	0	0	12	0	0	0	42
9 Jul	6	6	6	6	0	0	6	12	12	18	0	0
10 Jul	24	18	0	6	6	0	6	36	12	12	6	0
11 Jul	12	6	12	6	0	0	6	0	0	6	0	6
12 Jul	0	30	12	12	42	12	18	18	18	0	6	0
13 Jul	12	30	18	6	0	18	18	18	18	24	48	18
14 Jul	48	36	66	18	0	24	18	102	42	12	36	54
15 Jul	12	30	48	66	54	12	114	48	78	24	36	78
16 Jul	6	36	42	12	24	36	132	48	144	114	72	150
17 Jul	192	90	138	78	186	174	174	408	222	168	258	180
18 Jul	84	168	138	114	210	150	96	468	192	174	288	42
19 Jul	78	150	114	72	102	66	120	156	120	66	114	132
20 Jul	66	78	102	78	108	102	78	174	96	102	60	72
21 Jul	78	108	132	96	132	72	90	192	84	114	72	66
22 Jul	168	168	162	168	216	264	204	264	132	126	204	132
23 Jul	168	192	138	96	150	216	216	288	216	138	132	168
24 Jul	162	156	174	132	168	114	102	198	90	96	162	144
25 Jul	66	72	42	42	6	24	138	150	138	96	162	150
26 Jul	30	90	42	144	150	132	186	168	144	138	144	132
27 Jul	66	66	66	66	66	66	66	66	66	66	160	160
28 Jul	138	144	138	168	162	216	312	306	234	216	246	216
29 Jul	54	102	72	78	108	144	84	240	114	102	108	198
30 Jul	72	84	120	108	162	90	78	204	114	180	138	96
31 Jul	186	234	492	432	546	516	222	684	312	498	276	444
1 Aug	246	258	192	516	252	390	414	696	402	408	372	336
2 Aug	270	390	504	186	300	312	156	216	252	156	258	222
3 Aug	138	216	132	204	222	180	180	228	216	186	234	246
4 Aug	132	78	84	84	120	78	84	120	150	120	48	54
5 Aug	114	48	96	72	78	90	78	120	76	66	48	42
6 Aug	42	102	144	114	72	132	84	138	60	84	120	30
7 Aug	78	108	42	102	36	42	24	60	36	30	78	60
8 Aug	30	36	48	54	30	24	48	30	78	36	42	18
9 Aug	12	60	54	138	108	72	48	84	72	72	48	66
10 Aug	84	78	36	78	48	78	84	72	42	72	36	78
11 Aug	78	72	48	36	36	66	114	60	108	42	36	54
12 Aug	54	42	72	66	42	66	72	30	60	42	84	30
13 Aug	42	54	48	78	84	36	24	30	66	30	30	60
14 Aug	84	72	132	78	144	66	36	54	42	84	60	24
15 Aug	0	12	0	0	6	18	6	12	0	12	18	-18
Total	3,132	3,726	3,906	3,810	4,194	4,098	3,936	6,210	4,258	3,934	4,244	3,986
Hr %	3.3	3.9	4.1	4.0	4.4	4.3	4.1	6.5	4.4	4.1	4.4	4.1
Cum %	51.8	55.7	59.8	63.7	68.1	72.4	76.4	82.9	87.3	91.4	95.9	100.0

Appendix C4.–Yentna River south bank DIDSON estimates (total fish) by hour, 2010.

Date	Counts by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
7 Jul	6	0	6	0	0	0	0	0	6	0	6	0
8 Jul	6	6	0	6	0	0	0	0	0	0	0	12
9 Jul	0	0	0	0	0	0	0	3	0	6	6	0
10 Jul	0	0	0	0	6	0	0	0	0	0	6	0
11 Jul	6	0	12	0	6	0	6	0	0	6	6	0
12 Jul	0	0	-6	6	0	0	6	0	0	0	0	30
13 Jul	24	84	60	108	84	36	12	24	12	30	12	54
14 Jul	36	144	120	90	110	86	60	114	48	180	120	192
15 Jul	132	258	252	204	252	162	66	54	174	240	198	240
16 Jul	162	348	294	138	282	168	162	132	126	324	258	402
17 Jul	108	438	300	240	294	234	132	132	342	276	138	396
18 Jul	390	564	504	594	546	216	306	198	456	426	210	618
19 Jul	312	522	468	510	510	306	252	456	420	528	546	696
20 Jul	498	672	624	594	384	402	270	294	504	738	660	864
21 Jul	1,014	1,278	1,176	1,044	798	738	726	546	763	906	918	744
22 Jul	414	600	546	498	348	426	408	366	252	714	1,290	894
23 Jul	612	822	822	762	750	576	582	450	516	630	768	696
24 Jul	780	612	810	828	558	618	588	474	474	696	810	744
25 Jul	588	570	504	552	462	384	330	180	354	282	720	588
26 Jul	552	522	408	300	312	174	210	222	192	180	276	306
27 Jul	216	168	210	144	132	174	66	60	234	240	270	306
28 Jul	270	228	186	138	258	150	258	216	204	258	414	480
29 Jul	696	1,104	936	765	731	518	324	558	252	324	498	606
30 Jul	492	690	654	462	294	324	150	132	372	468	408	486
31 Jul	192	492	510	390	312	300	228	306	348	348	702	666
1 Aug	414	426	246	312	312	168	294	432	342	348	636	654
2 Aug	318	318	300	378	288	378	276	372	384	282	300	474
3 Aug	240	324	174	264	210	150	102	282	162	300	204	474
4 Aug	312	210	240	366	204	114	228	288	246	414	192	666
5 Aug	114	108	90	96	90	102	102	102	138	102	66	138
6 Aug	36	30	36	30	12	12	30	12	30	6	12	30
7 Aug	30	78	36	36	6	18	54	24	42	54	90	102
8 Aug	138	144	90	60	114	66	120	36	48	48	66	66
9 Aug	78	84	72	108	42	48	66	48	90	96	108	114
10 Aug	126	108	48	36	42	30	48	36	54	36	42	54
11 Aug	96	24	48	66	36	6	18	30	18	30	30	96
12 Aug	36	24	36	84	24	42	24	6	30	12	54	36
13 Aug	48	66	60	72	36	24	36	72	54	60	36	48
14 Aug	66	102	66	12	36	18	24	48	36	24	54	42
15 Aug	30	30	42	36	24	66	18	54	12	18	12	18
Total	9,588	12,198	10,980	10,329	8,904	7,233	6,582	6,759	7,735	9,630	11,142	13,032
Hr %	3.6	4.5	4.1	3.8	3.3	2.7	2.5	2.5	2.9	3.6	4.2	4.9
Cum %	3.6	8.1	12.2	16.1	19.4	22.1	24.5	27.0	29.9	33.5	37.7	42.5

-continued-

Appendix C4.-Page 2 of 2.

Date	Counts by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
7 Jul	0	0	12	0	0	5	8	11	6	24	12	12
8 Jul	6	0	6	6	6	0	6	0	0	2	0	2
9 Jul	5	12	6	0	6	0	6	24	6	18	0	0
10 Jul	6	0	0	6	0	0	0	0	6	0	0	0
11 Jul	18	18	6	6	6	18	12	0	0	12	12	0
12 Jul	6	12	6	6	6	12	24	18	60	30	24	36
13 Jul	12	30	42	48	36	42	90	84	42	72	84	54
14 Jul	204	222	216	234	192	336	294	378	414	168	276	162
15 Jul	132	282	210	210	432	372	222	360	258	168	246	186
16 Jul	228	270	304	270	312	342	186	234	198	312	168	246
17 Jul	312	408	486	768	648	474	948	720	552	522	558	408
18 Jul	360	636	516	624	654	810	780	882	738	702	684	228
19 Jul	402	390	588	546	600	782	336	930	570	564	306	492
20 Jul	876	900	1,284	906	870	942	822	1,152	1,158	990	1,056	948
21 Jul	510	576	750	486	528	708	804	978	486	504	552	402
22 Jul	750	732	720	654	906	1,110	1,218	1,110	726	1,272	870	582
23 Jul	600	678	840	882	732	684	576	1,116	576	630	810	846
24 Jul	630	648	726	714	786	606	552	744	684	618	420	606
25 Jul	354	504	522	630	702	438	570	471	174	450	492	384
26 Jul	192	522	432	348	492	480	384	720	294	330	222	162
27 Jul	228	198	462	246	348	534	294	474	252	276	402	312
28 Jul	382	312	402	426	780	852	870	810	888	768	978	984
29 Jul	510	612	696	840	576	696	774	864	528	756	558	684
30 Jul	708	510	570	516	714	462	276	576	276	342	402	348
31 Jul	588	684	828	498	804	804	624	942	552	306	258	240
1 Aug	882	948	708	882	1,188	1,080	828	1,056	822	870	534	306
2 Aug	408	570	444	318	234	444	552	516	504	336	558	228
3 Aug	300	492	390	426	474	510	378	606	282	258	144	204
4 Aug	246	336	264	462	480	300	222	456	276	348	192	210
5 Aug	102	42	96	66	84	72	78	120	72	65	48	42
6 Aug	36	96	72	60	72	72	18	48	66	42	60	30
7 Aug	150	138	102	72	126	84	120	114	78	114	120	114
8 Aug	72	66	138	42	204	90	84	120	78	78	90	36
9 Aug	72	126	192	84	102	96	150	96	96	84	144	60
10 Aug	60	36	108	42	60	54	78	60	48	78	36	102
11 Aug	60	12	78	48	54	48	78	30	48	42	24	12
12 Aug	42	60	54	24	84	78	54	78	90	42	60	54
13 Aug	56	78	126	60	114	60	96	42	60	42	48	54
14 Aug	84	114	78	42	120	60	66	42	42	18	48	48
15 Aug	12	6	36	24	18	54	18	6	24	48	6	36
Total	10,601	12,276	13,516	12,522	14,550	14,611	13,496	16,988	12,030	12,301	11,502	9,860
Hr %	4.0	4.6	5.0	4.7	5.4	5.4	5.0	6.3	4.5	4.6	4.3	3.7
Cum %	46.5	51.0	56.1	60.7	66.2	71.6	76.6	83.0	87.5	92.0	96.3	100.0



## **APPENDIX D: CRESCENT RIVER DATA**

Appendix D1.—Escapement counts by species for the north bank of the Crescent River, 2010.

Date	Sockeye		Pink		Chum		Coho		Chinook		Dolly Varden	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
24 Jun	1,891	1,891	0	0	0	0	0	0	0	0	0	0
25 Jun	694	2,585	0	0	0	0	0	0	0	0	0	0
26 Jun	3,017	5,602	0	0	0	0	0	0	0	0	0	0
27 Jun	1,325	6,927	0	0	0	0	0	0	0	0	0	0
28 Jun	2,449	9,376	0	0	0	0	0	0	0	0	0	0
29 Jun	1,541	10,917	0	0	0	0	0	0	0	0	0	0
30 Jun	1,344	12,261	0	0	0	0	0	0	0	0	0	0
1 Jul	1,304	13,565	0	0	0	0	0	0	0	0	0	0
2 Jul	963	14,528	0	0	0	0	0	0	0	0	0	0
3 Jul	917	15,445	0	0	0	0	0	0	0	0	0	0
4 Jul	1,489	16,934	0	0	0	0	0	0	0	0	0	0
5 Jul	1,215	18,149	0	0	0	0	0	0	0	0	11	11
6 Jul	1,538	19,687	0	0	0	0	0	0	0	0	0	11
7 Jul	1,081	20,768	0	0	0	0	0	0	0	0	0	11
8 Jul	986	21,754	0	0	0	0	0	0	0	0	11	22
9 Jul	2,412	24,166	0	0	17	17	0	0	0	0	17	39
10 Jul	2,092	26,257	0	0	0	17	0	0	0	0	80	119
11 Jul	1,882	28,139	0	0	0	17	0	0	0	0	0	119
12 Jul	1,607	29,746	0	0	37	54	0	0	0	0	0	119
13 Jul	1,116	30,862	0	0	16	70	0	0	0	0	0	119
14 Jul	1,200	32,062	0	0	0	70	0	0	0	0	0	119
15 Jul	391	32,453	0	0	0	70	0	0	0	0	0	119
16 Jul	816	33,269	0	0	0	70	0	0	0	0	0	119
17 Jul	630	33,898	16	16	16	86	0	0	0	0	0	119
18 Jul	791	34,689	0	16	0	86	0	0	0	0	17	136
19 Jul	414	35,103	0	16	21	107	0	0	0	0	0	136
20 Jul	1,193	36,296	0	16	18	125	0	0	0	0	36	173
21 Jul	461	36,757	36	51	18	143	0	0	9	9	0	173
22 Jul	283	37,040	40	91	19	162	0	0	0	9	7	180
23 Jul	1,124	38,164	128	220	71	233	0	0	12	21	12	191
24 Jul	1,202	39,366	145	365	103	336	0	0	0	21	83	274
25 Jul	729	40,095	28	393	169	505	0	0	0	21	196	471
26 Jul	888	40,983	0	393	400	905	0	0	0	21	44	515
27 Jul	534	41,517	0	393	219	1,124	0	0	0	21	82	597
28 Jul	407	41,924	0	393	163	1,286	0	0	0	21	41	638
29 Jul	432	42,356	0	393	144	1,430	0	0	0	21	62	699
30 Jul	502	42,858	13	406	66	1,496	0	0	0	21	53	752
31 Jul	365	43,223	0	406	69	1,565	0	0	0	21	12	764
1 Aug	406	43,630	16	422	88	1,653	0	0	0	21	0	764
2 Aug	567	44,197	13	435	117	1,770	0	0	0	21	9	773
3 Aug	325	44,522	9	444	46	1,816	0	0	0	21	9	782
4 Aug	387	44,909	13	458	58	1,874	0	0	0	21	6	788
5 Aug	159	45,068	7	465	29	1,903	0	0	0	21	7	795
Percent		93.4		1.0		3.9		0.0		0.0		1.6
Total		48,251										

Appendix D2.–Escapement counts by species for the south bank of the Crescent River, 2010.

Date	Sockeye		Pink		Chum		Coho		Chinook		Dolly Varden	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
24 Jun	1,216	1,216	0	0	0	0	0	0	0	0	0	0
25 Jun	450	1,666	0	0	0	0	0	0	0	0	0	0
26 Jun	1,075	2,741	0	0	0	0	0	0	0	0	0	0
27 Jun	1,365	4,106	0	0	0	0	0	0	0	0	0	0
28 Jun	1,562	5,668	0	0	0	0	0	0	0	0	0	0
29 Jun	1,151	6,819	0	0	0	0	0	0	0	0	0	0
30 Jun	1,227	8,046	0	0	0	0	0	0	0	0	0	0
1 Jul	1,089	9,135	0	0	0	0	0	0	0	0	0	0
2 Jul	1,351	10,486	0	0	0	0	0	0	0	0	0	0
3 Jul	884	11,370	0	0	0	0	0	0	0	0	0	0
4 Jul	1,189	12,559	0	0	0	0	0	0	0	0	0	0
5 Jul	1,039	13,598	0	0	0	0	0	0	0	0	9	9
6 Jul	1,414	15,012	0	0	0	0	0	0	0	0	0	9
7 Jul	1,410	16,422	0	0	0	0	0	0	0	0	0	9
8 Jul	91	16,513	0	0	0	0	0	0	0	0	1	10
9 Jul	620	17,133	0	0	4	4	0	0	0	0	4	15
10 Jul	508	17,642	0	0	0	4	0	0	0	0	20	34
11 Jul	2,072	19,714	0	0	0	4	0	0	0	0	0	34
12 Jul	1,285	20,999	0	0	30	34	0	0	0	0	0	34
13 Jul	1,199	22,198	0	0	17	51	0	0	0	0	0	34
14 Jul	1,277	23,475	0	0	0	51	0	0	0	0	0	34
15 Jul	1,340	24,815	0	0	0	51	0	0	0	0	0	34
16 Jul	1,799	26,614	0	0	0	51	0	0	0	0	0	34
17 Jul	1,519	28,133	38	38	38	89	0	0	0	0	0	34
18 Jul	1,797	29,930	0	38	0	89	0	0	0	0	39	73
19 Jul	1,562	31,491	0	38	79	169	0	0	0	0	0	73
20 Jul	1,459	32,950	0	38	22	191	0	0	0	0	44	117
21 Jul	1,155	34,105	90	128	45	236	0	0	23	23	0	117
22 Jul	1,336	35,442	187	315	93	329	0	0	0	23	31	148
23 Jul	813	36,255	93	407	51	380	0	0	8	31	8	157
24 Jul	864	37,119	104	512	74	454	0	0	0	31	60	217
25 Jul	551	37,669	21	533	127	580	0	0	0	31	148	365
26 Jul	654	38,323	0	533	294	875	0	0	0	31	33	397
27 Jul	375	38,698	0	533	154	1,029	0	0	0	31	58	455
28 Jul	198	38,896	0	533	79	1,107	0	0	0	31	20	475
29 Jul	226	39,122	0	533	75	1,183	0	0	0	31	32	507
30 Jul	355	39,477	9	542	47	1,229	0	0	0	31	37	545
31 Jul	276	39,753	0	542	52	1,281	0	0	0	31	9	553
1 Aug	368	40,121	14	557	79	1,361	0	0	0	31	0	553
2 Aug	362	40,483	8	565	75	1,435	0	0	0	31	6	559
3 Aug	232	40,716	7	572	33	1,468	0	0	0	31	7	566
4 Aug	37	40,753	1	573	6	1,474	0	0	0	31	1	566
5 Aug	512	41,265	23	596	93	1,567	0	0	0	31	23	590
Percent		93.7		1.4		3.6		0.0		0.1		1.3
Total		44,050										

Appendix D3.–Crescent River north bank counts (total fish) by hour, 2010.

Date	Counts by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
24 Jun	40	27	51	12	24	11	37	18	28	92	73	13
25 Jun	5	2	7	7	18	11	28	19	9	20	26	12
26 Jun	12	21	18	44	33	14	49	24	12	11	39	35
27 Jun	29	41	3	0	3	11	12	8	14	20	46	16
28 Jun	58	55	55	56	53	54	52	51	105	23	120	99
29 Jun	31	19	55	5	4	1	35	43	16	26	28	48
30 Jun	11	15	15	5	51	36	17	26	6	41	21	62
1 Jul	42	10	3	15	50	64	53	44	43	16	43	37
2 Jul	34	16	14	28	28	20	23	6	6	17	32	14
3 Jul	27	16	8	21	38	11	14	19	34	19	20	30
4 Jul	78	45	10	10	37	33	22	54	40	30	26	83
5 Jul	94	41	29	11	32	48	42	5	46	16	10	23
6 Jul	3	1	8	7	2	10	13	13	46	53	55	89
7 Jul	7	5	2	18	35	10	10	40	28	75	1	41
8 Jul	48	52	55	40	57	38	44	74	145	54	95	97
9 Jul	23	22	14	20	16	27	14	3	4	3	0	191
10 Jul	31	19	5	82	17	41	81	71	92	126	78	72
11 Jul	19	1	0	0	11	27	27	30	84	96	111	128
12 Jul	12	3	0	0	2	5	5	2	23	30	113	79
13 Jul	22	0	0	1	1	10	9	33	82	37	53	60
14 Jul	1	3	7	3	11	17	38	8	38	60	84	115
15 Jul	17	4	9	3	10	9	5	3	5	3	3	11
16 Jul	4	1	1	33	22	22	28	18	20	86	74	45
17 Jul	2	7	0	24	12	15	36	11	33	26	25	75
18 Jul	23	20	1	6	20	20	59	32	50	45	46	50
19 Jul	12	4	12	6	8	22	41	3	11	19	42	23
20 Jul	43	44	43	44	44	52	62	37	31	53	28	33
21 Jul	6	13	12	22	41	35	15	24	79	13	0	21
22 Jul	14	14	0	14	13	14	3	57	37	5	8	20
23 Jul	5	6	4	1	7	2	0	0	1	56	55	11
24 Jul	20	0	3	4	7	52	25	27	13	32	40	25
25 Jul	23	26	9	4	3	9	2	7	4	8	7	4
26 Jul	48	38	28	8	54	19	41	29	53	55	62	60
27 Jul	7	12	4	15	6	28	31	39	43	40	47	37
28 Jul	14	3	1	18	12	12	26	23	26	29	15	11
29 Jul	18	10	8	8	22	24	25	9	33	36	26	22
30 Jul	21	40	22	23	25	43	27	26	34	26	28	18
31 Jul	18	9	16	8	9	19	35	19	28	36	23	25
1 Aug	16	3	11	7	19	19	18	16	24	24	28	56
2 Aug	6	4	3	0	10	26	15	10	47	41	26	44
3 Aug	19	3	8	5	11	4	9	12	22	24	30	18
4 Aug	10	20	24	30	21	17	38	23	23	19	12	22
5 Aug	5	0	4	8	2	7	6	5	23	20	14	20
Total	978	695	582	676	901	969	1,172	1,021	1,541	1,561	1,713	1,995
%	2.0	1.4	1.2	1.4	1.9	2.0	2.4	2.1	3.2	3.2	3.6	4.1
Cum	2.0	3.5	4.7	6.1	7.9	10.0	12.4	14.5	17.7	20.9	24.5	28.6

-continued-

Appendix D3.–Page 2 of 2.

Date	Counts by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
24 Jun	51	115	143	118	165	126	252	188	141	82	45	39
25 Jun	10	22	15	52	50	46	37	66	64	127	37	4
26 Jun	13	25	24	25	6	4	425	911	707	307	160	98
27 Jun	79	39	142	84	83	50	51	67	241	154	61	71
28 Jun	77	175	95	148	68	65	65	50	298	338	208	81
29 Jun	68	63	48	162	77	105	56	137	102	251	142	19
30 Jun	120	138	80	54	37	13	13	31	296	84	53	119
1 Jul	102	109	143	98	54	16	15	8	16	32	150	141
2 Jul	67	121	53	39	20	21	12	15	4	18	224	131
3 Jul	43	135	62	26	43	16	9	12	5	13	120	176
4 Jul	123	155	136	107	23	18	12	8	6	12	152	269
5 Jul	69	106	96	103	117	205	43	41	38	7	3	1
6 Jul	209	146	109	120	103	158	133	133	76	42	8	1
7 Jul	172	170	68	14	18	118	114	54	14	31	14	22
8 Jul	91	2	14	3	5	9	7	13	13	12	15	14
9 Jul	270	156	271	228	148	71	277	300	211	64	74	38
10 Jul	105	149	120	85	134	254	240	73	145	106	27	19
11 Jul	163	97	94	82	67	63	247	221	184	120	9	1
12 Jul	105	127	155	213	120	46	259	232	91	19	3	0
13 Jul	77	77	89	64	57	37	64	49	144	89	28	49
14 Jul	101	62	94	85	53	38	10	109	109	89	43	22
15 Jul	3	2	15	13	9	9	2	24	102	74	48	8
16 Jul	69	40	32	19	13	8	14	7	30	110	103	17
17 Jul	65	60	28	11	14	19	13	4	10	40	74	57
18 Jul	34	46	53	55	53	23	19	48	36	18	41	10
19 Jul	19	19	19	19	33	12	25	23	16	22	13	12
20 Jul	23	63	56	125	65	57	88	81	66	51	44	14
21 Jul	23	17	14	2	5	12	27	56	46	29	1	11
22 Jul	67	11	7	0	18	6	7	13	0	12	2	7
23 Jul	37	33	34	34	40	399	324	203	35	20	8	31
24 Jul	22	26	16	8	26	61	663	329	71	28	21	14
25 Jul	26	15	32	23	17	28	166	275	83	84	192	75
26 Jul	68	76	57	50	50	38	31	129	106	93	80	59
27 Jul	29	25	46	55	55	10	59	69	69	47	44	18
28 Jul	30	20	42	52	59	54	29	18	52	34	8	22
29 Jul	27	26	46	15	27	51	22	36	23	43	42	39
30 Jul	31	33	24	27	33	23	23	16	20	26	25	20
31 Jul	28	22	38	22	14	20	15	5	13	7	4	13
1 Aug	32	16	18	30	9	18	20	12	17	29	35	33
2 Aug	42	81	60	64	36	30	35	32	7	13	16	58
3 Aug	17	9	29	34	53	28	16	12	9	13	0	5
4 Aug	21	12	23	20	23	6	14	15	19	26	11	16
5 Aug	8	8	10	1	12	4	14	14	7	5	5	0
Total	2,836	2,849	2,750	2,589	2,112	2,395	3,967	4,139	3,742	2,821	2,393	1,854
%	5.9	5.9	5.7	5.4	4.4	5.0	8.2	8.6	7.8	5.8	5.0	3.8
Cum	34.5	40.4	46.1	51.5	55.8	60.8	69.0	77.6	85.4	91.2	96.2	100.0

Appendix D4.-Crescent River south bank counts (total fish) by hour, 2010.

Date	Counts by Hour											
	1	2	3	4	5	6	7	8	9	10	11	12
24 Jun	0	0	0	5	6	2	0	22	8	6	8	31
25 Jun	0	0	5	0	0	4	0	0	2	0	0	11
26 Jun	0	0	0	5	0	2	0	1	0	3	3	10
27 Jun	5	8	7	9	0	0	26	35	10	12	86	59
28 Jun	9	0	0	1	0	4	11	11	15	66	32	72
29 Jun	18	0	8	8	0	0	42	17	39	0	13	25
30 Jun	58	19	13	16	0	6	6	8	8	11	82	139
1 Jul	11	13	3	0	5	0	1	1	24	27	30	74
2 Jul	12	34	0	0	40	19	12	25	28	77	154	89
3 Jul	22	6	4	9	3	2	4	41	16	40	62	45
4 Jul	42	29	13	2	7	6	9	15	49	38	97	101
5 Jul	64	32	20	6	7	7	34	12	9	42	11	25
6 Jul	1	6	1	17	25	30	45	42	32	28	70	81
7 Jul	5	19	12	20	41	12	35	24	40	65	97	63
8 Jul	2	5	0	1	0	3	4	1	17	11	13	15
9 Jul	0	17	0	0	0	1	6	3	1	18	52	55
10 Jul	9	0	2	2	2	0	16	27	1	8	21	22
11 Jul	4	0	3	3	0	7	37	29	40	45	112	256
12 Jul	5	2	0	1	5	2	1	5	18	31	36	126
13 Jul	0	0	2	4	2	0	3	1	22	42	62	49
14 Jul	5	1	3	3	3	10	23	16	30	98	122	203
15 Jul	11	2	6	5	12	31	21	26	71	132	168	109
16 Jul	2	1	2	0	4	9	24	59	48	37	204	204
17 Jul	3	1	10	10	7	23	29	22	27	73	67	144
18 Jul	28	2	4	28	4	27	25	68	29	85	104	191
19 Jul	2	5	10	3	0	17	23	44	70	98	212	143
20 Jul	18	6	8	6	21	30	62	46	44	67	46	47
21 Jul	0	0	6	3	19	26	31	67	106	97	115	125
22 Jul	8	6	13	28	26	38	39	103	110	20	68	110
23 Jul	2	9	3	8	4	4	11	3	10	38	41	43
24 Jul	15	5	6	3	7	8	14	28	5	54	61	91
25 Jul	9	19	8	3	0	7	6	20	44	15	14	62
26 Jul	5	11	1	14	6	24	40	7	9	37	24	78
27 Jul	9	2	2	1	2	7	21	8	4	16	37	53
28 Jul	7	3	7	0	3	0	0	1	4	8	7	13
29 Jul	7	1	17	6	20	9	1	0	3	10	12	1
30 Jul	3	3	2	5	0	0	10	20	16	25	167	23
31 Jul	0	0	0	0	0	0	7	2	1	0	23	10
1 Aug	1	2	0	1	2	15	12	20	15	18	84	66
2 Aug	2	3	5	3	9	5	10	5	14	33	17	31
3 Aug	0	0	2	0	0	0	2	3	7	9	8	22
4 Aug	7	0	3	3	9	2	0	2	0	2	1	0
5 Aug	0	1	2	0	0	15	3	15	17	22	21	36
Total	411	273	213	242	301	414	706	905	1,063	1,564	2,664	3,153
%	0.9	0.6	0.5	0.5	0.7	0.9	1.6	2.1	2.4	3.6	6.0	7.2
Cum	0.9	1.6	2.0	2.6	3.3	4.2	5.8	7.9	10.3	13.8	19.9	27.0

-continued-

Appendix D4.–Page 2 of 2.

Date	Counts by Hour											
	13	14	15	16	17	18	19	20	21	22	23	24
24 Jun	39	92	159	179	99	69	156	153	116	46	18	2
25 Jun	5	11	49	43	45	33	23	86	47	68	15	3
26 Jun	17	25	15	22	8	5	91	319	224	125	91	109
27 Jun	71	117	123	99	116	102	47	53	170	153	49	8
28 Jun	159	150	88	118	62	59	44	44	292	242	70	13
29 Jun	64	80	91	124	71	63	76	38	62	152	104	56
30 Jun	102	38	40	60	29	13	96	0	93	243	100	47
1 Jul	110	173	99	65	51	30	38	17	17	57	158	85
2 Jul	177	142	55	89	51	36	41	19	11	13	144	83
3 Jul	59	81	59	49	30	36	32	17	27	12	103	125
4 Jul	77	133	73	40	15	20	26	0	20	42	190	145
5 Jul	96	101	120	55	42	37	110	77	33	46	58	4
6 Jul	170	160	106	105	97	109	135	53	40	28	17	16
7 Jul	127	119	179	76	35	168	97	85	34	35	16	6
8 Jul	2	9	1	0	6	1	0	0	0	1	0	0
9 Jul	54	9	62	55	18	25	56	110	35	36	16	0
10 Jul	45	51	43	45	48	42	23	23	38	51	9	0
11 Jul	255	118	77	93	66	71	390	329	103	20	9	5
12 Jul	116	148	160	100	96	49	118	190	64	21	10	11
13 Jul	69	121	133	135	66	46	38	78	184	126	21	12
14 Jul	108	101	62	80	51	19	22	50	123	66	59	19
15 Jul	80	92	57	36	26	11	13	32	152	195	38	14
16 Jul	179	150	118	99	52	37	29	27	70	323	101	20
17 Jul	259	161	90	134	91	40	62	27	15	126	142	32
18 Jul	243	267	269	165	123	57	67	13	8	11	10	8
19 Jul	138	151	190	159	102	44	103	52	21	14	22	18
20 Jul	64	80	102	122	223	179	147	117	57	18	10	5
21 Jul	103	79	85	58	71	73	111	50	24	38	19	7
22 Jul	170	88	82	58	83	120	119	147	103	71	33	4
23 Jul	63	48	58	99	28	29	128	159	138	12	29	7
24 Jul	84	37	74	18	72	43	175	163	78	28	24	9
25 Jul	56	50	31	26	26	13	47	164	67	80	48	32
26 Jul	84	89	65	49	69	22	83	64	139	36	17	8
27 Jul	40	44	24	23	35	20	7	90	77	44	12	9
28 Jul	11	24	29	22	11	26	33	13	29	12	26	8
29 Jul	8	27	19	29	9	21	15	4	7	29	55	23
30 Jul	30	8	14	15	41	13	8	3	9	16	15	2
31 Jul	18	27	28	75	44	34	22	17	14	7	2	6
1 Aug	37	20	34	36	19	9	9	7	3	21	17	14
2 Aug	28	45	53	44	45	21	31	22	1	10	7	6
3 Aug	30	26	30	52	32	21	17	7	0	1	4	6
4 Aug	11	0	0	1	0	2	2	0	0	0	0	0
5 Aug	75	56	70	83	57	43	58	50	9	9	10	0
Total	3,733	3,548	3,316	3,035	2,361	1,911	2,945	2,969	2,754	2,684	1,898	987
%	8.5	8.1	7.5	6.9	5.4	4.3	6.7	6.7	6.3	6.1	4.3	2.2
Cum	35.5	43.6	51.1	58.0	63.3	67.7	74.4	81.1	87.4	93.5	97.8	100.0

Appendix D5.–Crescent River north bank Bendix sonar counts (total fish) by sector, 2010.

Date	Counts by Sector											
	1	2	3	4	5	6	7	8	9	10	11	12
24 Jun	163	774	549	263	66	16	6	3	0	0	1	50
25 Jun	85	138	145	174	91	37	4	4	0	1	0	15
26 Jun	1,048	1,512	298	86	54	10	4	4	0	0	0	1
27 Jun	870	369	58	11	9	2	2	1	1	0	1	1
28 Jun	1,205	646	546	30	11	2	5	4	0	0	0	0
29 Jun	676	555	267	30	6	3	1	2	1	0	0	0
30 Jun	87	337	618	216	68	6	5	3	3	1	0	0
1 Jul	18	282	818	157	21	2	2	4	0	0	0	0
2 Jul	13	206	458	185	73	15	2	6	2	3	0	0
3 Jul	10	40	279	300	231	39	7	5	2	0	0	4
4 Jul	9	332	626	371	117	18	4	11	1	0	0	0
5 Jul	212	578	264	133	28	3	5	1	1	1	0	0
6 Jul	351	884	276	24	2	1	0	0	0	0	0	0
7 Jul	42	446	507	75	10	1	0	0	0	0	0	0
8 Jul	831	104	33	23	5	1	0	0	0	0	0	0
9 Jul	1,329	871	212	31	2	0	0	0	0	0	0	0
10 Jul	1,339	725	92	16	0	0	0	0	0	0	0	0
11 Jul	1,150	729	3	0	0	0	0	0	0	0	0	0
12 Jul	762	865	15	2	0	0	0	0	0	0	0	0
13 Jul	566	552	14	0	0	0	0	0	0	0	0	0
14 Jul	377	801	21	1	0	0	0	0	0	0	0	0
15 Jul	198	154	31	8	0	0	0	0	0	0	0	0
16 Jul	486	306	20	4	0	0	0	0	0	0	0	0
17 Jul	268	313	75	5	0	0	0	0	0	0	0	0
18 Jul	430	250	125	3	0	0	0	0	0	0	0	0
19 Jul	284	112	38	1	0	0	0	0	0	0	0	0
20 Jul	1,005	229	13	0	0	0	0	0	0	0	0	0
21 Jul	245	269	10	0	0	0	0	0	0	0	0	0
22 Jul	117	223	9	0	0	0	0	0	0	0	0	0
23 Jul	50	509	599	149	14	13	11	0	1	0	0	0
24 Jul	10	232	835	385	57	8	4	1	1	0	0	0
25 Jul	26	443	468	145	35	1	4	0	0	0	0	0
26 Jul	425	528	336	30	9	3	1	0	0	0	0	0
27 Jul	237	244	262	82	8	1	0	0	0	1	0	0
28 Jul	26	185	218	155	25	1	0	0	0	0	0	0
29 Jul	17	90	311	201	8	7	4	0	0	0	0	0
30 Jul	313	193	99	21	2	0	4	2	0	0	0	0
31 Jul	120	98	77	72	43	19	8	3	2	1	0	3
1 Aug	101	114	148	128	12	5	1	1	0	0	0	0
2 Aug	101	80	235	192	86	10	1	1	0	0	0	0
3 Aug	31	101	98	103	55	2	0	0	0	0	0	0
4 Aug	98	189	94	48	24	9	2	0	1	0	0	0
5 Aug	0	167	33	0	0	1	0	0	0	0	0	1
Total	15,731	16,775	10,233	3,860	1,172	236	87	56	16	8	2	75
Percent	32.6	34.8	21.2	8.0	2.4	0.5	0.2	0.1	0.0	0.0	0.0	0.2
Cum	32.6	67.4	88.6	96.6	99.0	99.5	99.7	99.8	99.8	99.8	99.8	100.0

Appendix D6.–Crescent River south bank Bendix sonar counts (total fish) by sector, 2010.

Date	Counts by Sector											
	1	2	3	4	5	6	7	8	9	10	11	12
24 Jun	81	705	357	65	4	1	0	0	0	0	1	2
25 Jun	35	188	184	40	3	0	0	0	0	0	0	0
26 Jun	201	630	198	42	4	0	0	0	0	0	0	0
27 Jun	502	678	157	26	2	0	0	0	0	0	0	0
28 Jun	414	768	338	35	5	2	0	0	0	0	0	0
29 Jun	395	496	228	31	1	0	0	0	0	0	0	0
30 Jun	247	530	361	80	9	0	0	0	0	0	0	0
1 Jul	172	431	392	89	5	0	0	0	0	0	0	0
2 Jul	80	557	594	106	10	3	1	0	0	0	0	0
3 Jul	35	251	429	143	25	1	0	0	0	0	0	0
4 Jul	85	480	507	109	7	1	0	0	0	0	0	0
5 Jul	235	537	243	27	6	0	0	0	0	0	0	0
6 Jul	339	757	281	37	0	0	0	0	0	0	0	0
7 Jul	170	729	419	91	1	0	0	0	0	0	0	0
8 Jul	54	24	13	1	0	0	0	0	0	0	0	0
9 Jul	375	195	51	8	0	0	0	0	0	0	0	0
10 Jul	121	305	86	9	1	1	2	3	0	0	0	0
11 Jul	420	1095	493	60	2	2	0	0	0	0	0	0
12 Jul	342	644	283	38	5	3	0	0	0	0	0	0
13 Jul	243	712	235	24	2	0	0	0	0	0	0	0
14 Jul	188	741	317	28	3	0	0	0	0	0	0	0
15 Jul	267	750	300	19	4	0	0	0	0	0	0	0
16 Jul	324	1086	357	25	6	1	0	0	0	0	0	0
17 Jul	274	948	335	32	4	2	0	0	0	0	0	0
18 Jul	461	983	368	22	2	0	0	0	0	0	0	0
19 Jul	338	837	424	37	3	2	0	0	0	0	0	0
20 Jul	226	842	421	34	1	0	1	0	0	0	0	0
21 Jul	192	693	381	39	5	1	1	1	0	0	0	0
22 Jul	112	905	568	58	4	0	0	0	0	0	0	0
23 Jul	45	453	432	38	5	0	1	0	0	0	0	0
24 Jul	9	399	598	86	10	0	0	0	0	0	0	0
25 Jul	5	313	440	82	7	0	0	0	0	0	0	0
26 Jul	93	513	335	38	2	0	0	0	0	0	0	0
27 Jul	12	321	237	17	0	0	0	0	0	0	0	0
28 Jul	9	95	155	34	4	0	0	0	0	0	0	0
29 Jul	12	84	164	65	8	0	0	0	0	0	0	0
30 Jul	40	280	116	11	0	0	0	1	0	0	0	0
31 Jul	103	173	59	1	1	0	0	0	0	0	0	0
1 Aug	103	256	97	6	0	0	0	0	0	0	0	0
2 Aug	51	295	102	2	0	0	0	0	0	0	0	0
3 Aug	47	172	58	2	0	0	0	0	0	0	0	0
4 Aug	17	16	11	1	0	0	0	0	0	0	0	0
5 Aug	228	279	138	6	1	0	0	0	0	0	0	0
Total	7,702	22,146	12,262	1,744	162	20	6	5	0	0	1	2
Percent	17.5	50.3	27.8	4.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cum	17.5	67.8	95.6	99.6	100.0	100	100	100	100	100	100	100